Automotive Service Digest

Our 49th year

April, 1961

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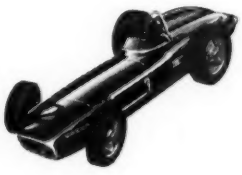
It's easy and fun to enter...just predict the qualification speed of the pole position winner in the 1961 Speedway time trials!

Plan now to live it up like a king this year at the Indianapolis Speedway Classic! You'll get the full red carpet treatment with a first class round trip by air. Four enjoyable days . . . hotel accommodations and meals—a special tour—and $50.00 pocket money. If you are a winner you may bring any male employee of your Perfect Circle supplier as a guest. And all winners and guests who make the trip automatically qualify for the grand prize Thunderbird drawings. All you need do is estimate the winning pole position speed in the qualifying time trials and send it in with a PC box part number tab.

You compete only with entrants in your area and you may enter many times. Contest ends April 30, 1961 so enter early —enter often Complete contest rules are on the official entry form—get one at your PC supplier and test your skill today!

HURRY!
HURRY!



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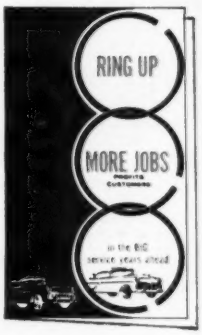

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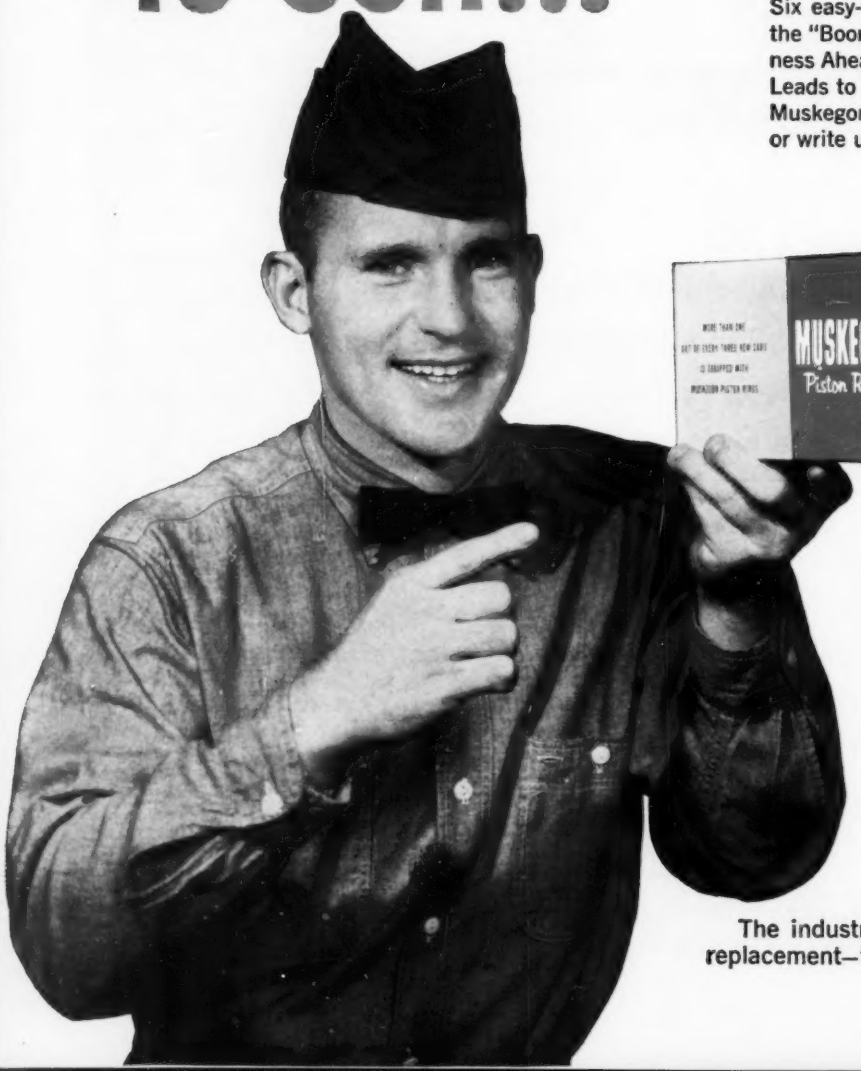

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VOLUME XLIX
No. 591

April 1961

Automotive Service Digest

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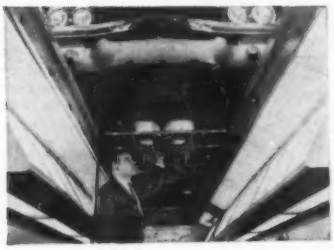

Cover Subject

Accelerating up a hill, braking down the other side, open road and city traffic conditions—all can be simulated electronically on this "highway." Shown is a 1961 Dodge Lancer undergoing extensive road tests —indoors.

Articles

14 The piston—a three-ring circus
22 Collision damage repair on a 1960 Valiant
32 Will single-leaf springs appear in '62?
38 The cooling system—keep it clean
46 Servicing the Tempest "rope" drive shaft
48 Coming—the corrosion-free body
54 Liquid-locking nuts and bolts
58 Pressures and their measurements

Features

6 Automotive clinic
10 Spokes from the "hub"
13 Editor's page
60 New products
74 Photos from here and there
77 Refresher course
81 Calendar of automotive events

Technical help for the service shop

Tech Know-How articles cover how-to and what's new in approved, up-to-date shop practices, as seen and understood by men experienced in the trade. *Business Know-How*, the dollar-sign side of automotive service work; *Service Education*, the who-what-where-how of today's trade training.

SYMBOLIZES A.S.D. "TECH KNOW-HOW" FEATURE ARTICLES

LEARN MORE EARN MORE
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Automotive clinic

Stuck on some problem? Need help on a job? Write us about your problem on your SHOP LETTERHEAD to insure receiving the information you are looking for. The Automotive Clinic is exclusively conducted for shop operators and others actively in the automotive service business.

Address your letter to Automotive Clinic c/o AUTOMOTIVE SERVICE DIGEST, 900 So. Wabash Ave., Chicago 5, Ill.

Ben Ikert, Editor

Wants Pin-pointed Answers

I read ASD at the dealership where I work and enjoy it excepting for one thing—your Automotive Clinic.

Don't you think it would be of more value to readers to feature some of the tough problems that mechanics have encountered and then solved. That is, tell them exactly how they were solved instead of leaving us with all the "could be's" and "seems like?" —*F. C., Vicksburg, Miss.*

Answer: We cannot help but agree with you that it would be more helpful if we could outline tough actual problems and then tell how they were solved. You may recall that about a year ago we ran a number of instances such as this under the title "The Instrument Man."

The bad part of the letters we receive is that they often do not give full details or the results of adequate testing in connection with their diagnosis to enable us to do more than give suggestions and, as you say, "could-be's."

Then, too, we almost never get follow-up letters telling how the problem was actually solved. We do have cases where some of our good friends tell us of some of their "toughies," and these are often mentioned in our service articles.

You can do your bit to help your fellow service men by sending in reports of your own problems and how they were solved. Maybe your good example will encourage more of the boys to do the same.

Too Much Advance at Idle

I installed a 1960 four-barrel carburetor on a '55 Chevrolet but there was no place on the carburetor for a vacuum connection. A hole had to be drilled in the manifold on the hold-down mounts of the carburetor.

The vacuum is always advanced when the engine idles and the vacuum is too high. I would like to know if we have to install a 1960 vacuum advance diaphragm on the distributor, or a 1960 distributor to correspond with the carburetor. I noticed the two-barrel carburetor with the hollow stud on a 1961 police car and it idles okeh. What is my remedy?—*G.S.T., Huntington Park, Calif.*

Answer: The 1960 carburetor gets its vacuum directly from the intake manifold. Thus instead of having the vacuum modified at idle by the throttle opening, there will be full manifold vacuum on the vacuum advance device when the engine is idling and has its highest normal vacuum. This will cause the distributor to have its highest vacuum advance at idle. This is not objectionable except that it may make the engine run a little roughly at idle.

It will not be necessary to change the distributor vacuum diaphragm. The hollow stud that came with the carburetor should be used to pick up the vacuum from the intake manifold. There actually is not too much vacuum, only more than you have been used to.

You must remember that whenever you start using parts from one model on a different model, you are liable to get action somewhat different from what you anticipated. In some cases it will not make much difference.

Torque Drive Slips

A 1953 Dodge V8 with fluid torque drive and which has a combined oiling system with the engine, slips excessively every time it is driven when cold, or after standing an hour or so. However, when the engine is warmed up, it picks up speed instantly.

I have installed a new pressure regulating valve, making sure that the contacting surface of the check ball and the passages in the torque converter were clean. But it still slips.

Even increased the spring tension slightly in an attempt to check the oil drainback. Still no help. There is no oil leakage or oil level loss anywhere. What have I missed?—*C.E.C., Oakland, Calif.*

Answer: From your description of the trouble it would appear that either the front pump is badly worn or the annular seals are leaking when cold. When they get heated up they will swell enough to hold the oil and the transmission works normally.

It is possible that the trouble comes from a combination of the two sources. To correct them it will be necessary to remove and open up the transmission.

Gauge Reads Too High

A customer came in with a 1959 Ford 6-cylinder car on which the heat gauge registered all the way over to the hot side—but the engine was not overheated. The car has 6,000 miles on the speedometer.

We first put in a new gauge sending unit but it did not help. On further checking we found the fuel gauge always showed "full." We took both gauges out and they were burned up.

Next we checked the little regulator

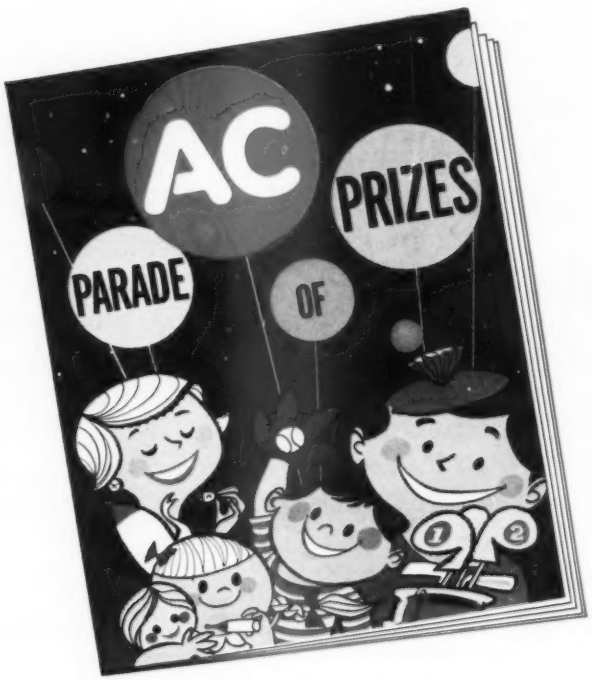
(Continued on page 44)

Take advantage of your Automotive Service Digest clinic. Countless other shopmen do—so why not you? Your participation is welcomed.

AC SELLING *SLANT* OF THE MONTH!

MONEY-MAKING FACTS FOR DEALERS

Pick from over 350 top-brand gifts in AC's...



Parade of Prizes

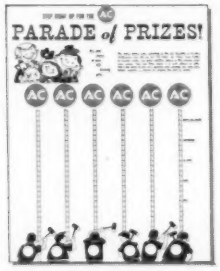
Here's the Biggest Selling Bonus in the Industry!

What a deal! Now you can have your choice of BIG gift rewards for stocking and selling fast-moving, top-quality AC products. Here's a chance of a lifetime to get that gift you've always wanted—and it won't cost you one cent more than you'd normally pay for your AC products alone. This tremendous gift bonus is a part of every AC "Parade of Prizes" Merchandising Package. The AC Oil Filter deal on the following pages is the first of these "Parade of Prizes" Packages. You'll want to watch for other similar deals coming soon. Here are the "Parade of Prizes" items each Merchandising Package includes:

YOU GET THIS EXCITING "PARADE OF PRIZES" GIFT CATALOG

It's big, colorful and jam-packed with top-brand gifts for the entire family. You get your choice of over 350 gifts in all, by the nation's leading manufacturers. Each is fully described and given a prize point value. The "Parade of Prizes" Catalog is complete with dealer order form and self-addressed return envelope.

YOU GET A SALES-BUILDING EMPLOYES' SALES CONTEST CHART



To help move more merchandise, start a "Parade of Prizes" sales incentive contest among your employes. Several suggestions for rewarding the winners are given on the contest chart. Everyone is rewarded by such a contest in fun, prizes, sales and profits.

YOU GET VALUABLE PRIZE POINT CERTIFICATES

A handy booklet of AC Prize Points is also included in each package. They can be redeemed immediately for many quality gifts—or accumulated for higher-point-value items. Because this program is continuous, you can save prize points from any of the new "Parade of Prizes" Merchandising Packages.

Get in on AC's PARADE OF PRIZES Now!

AC SELLING *SLANTS*

MONEY-MAKING FACTS

Prizes and Profits are

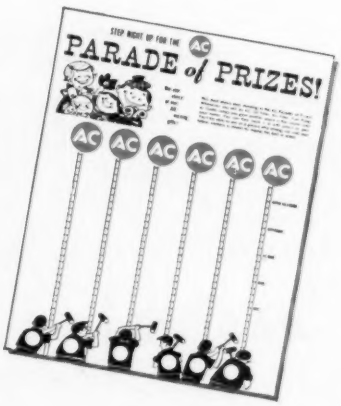
There's never been anything like AC's "Parade of Prizes" OFM-86 deal! All you have to do is stock and sell AC Triple-Trapper Oil Filters. Your supplier and AC make available to you your choice of over 350 valuable gifts—at no charge! What's more—AC Oil Filters are the most popular original equipment oil filters on the market—so they're fast-moving. Here's a deal that's loaded to the brim with all sorts of prizes and surprises.

LOOK WHAT YOU GET WITH OFM-86:

EXCITING "PARADE OF PRIZES" CATALOG OF TOP-BRAND GIFTS—Over 350 in all. Gifts for the sportsman, camera bug, homemaker—by famous makers. Each gift is fully described and given a prize point value. Catalog is complete with dealer order form and self-addressed return envelope.

VALUABLE PRIZE POINT CERTIFICATES—Each OFM-86 Merchandising Package contains a handy booklet of 340 "Parade of Prizes" prize points. You can cash them in immediately for one of many wonderful prizes—or save them for a bigger prize. The program is continuous.

EMPLOYES' SALES CONTEST CHART—Your entire sales team is included when you use this special "Parade of Prizes" Contest Chart. Instructions tell how to stage your own contest and reward the winners. Use it to step up sales and profits.



OF THE MONTH ! AC

FOR DEALERS

Yours with AC's OFM-86

24 AC TRIPLE-TRAPPER OIL FILTERS

All of the oil filters in AC's OFM-86 Merchandising Package are fast-moving. They include the following types: 2—PF-7, 4—P-115, 8—PF-122, 4—PF-141, 4—PF-210, 1—PF-316, 1—PF-336. These popular filter elements cover more than 90% of the passenger car market.

COLORFUL, EYE-CATCHING WINDOW TRIM

Use this one-piece window trim to establish your station as a neighborhood headquarters for oil and air filter changes. The trim is magically easy to install as it tends to cling to the glass while you position and fasten it. It's transparent, too, so it won't obstruct the view of customers or business activities.

Here's How You Get

OFM-86

To join the AC Parade of Prizes, all you have to do is pay $37.28 . . . your usual dealer price . . . for the 24 popular AC Oil Filter Elements listed in the OFM-86 package! You keep your full profit on every filter! The window trim, contest chart, Parade of Prizes catalog and prize point certificates worth 340 points are added at no charge.

ORDER OFM-86
FROM YOUR AC SUPPLIER!

By J. EDWARD SCHIPPER
Detroit Editor

Spokes from the "hub"

• STUDEBAKER-PACKARD CORP. is continuing to diversify by absorbing other companies and creating new divisions. Latest is Chemical Compounds, Inc., which processes and distributes additives for motor oil and fuel. Its principal product is STP, an oil additive used in engines designed to protect against wear. It is essentially a viscosity index improver, decreasing the thinning of oil when heated. This is the sixth acquisition since S-P began its diversification program. Others include the Onan Division, Clark Floor Machine Division, Gravely Tractor, Gering plastics, and CTL, a pioneer in the development of high temperature thermal shielding for missiles. Sales volume of all divisions other than the Studebaker Automotive Division is estimated at over $100 million.

* * *

This from the public relations department of American Motors: "Leave it to a Texan to come up with a million-in-one coincidence. R. O. Statum of Ft. Worth has just discovered that the ignition key to his 1961 Rambler fits the front door of his house, which was built in 1941." (Wonder what kind of locks they put on front doors in Texas?)

* * *

As might be expected, loud outcries are being heard from the trucking industry through the American Trucking Associations, Inc., protesting the White House message on highways. This message proposes additional taxes on motor trucks. Commenting on this subject the ATA states that "the recommendations for new staggering taxes on motor trucks are based upon a seriously incomplete and entirely theoretical Commerce Department report which the new Administration inherited when it took office."

The ATA points out that this tax proposal, while suggested as an alternative tax on consumers, actually falls directly on consumers since trucks haul everything that Americans eat, use and wear. The cost of food, clothing and every type of industrial and commercial product would be affected directly by increases in transportation cost. Currently state road taxes paid annually by the average 5-axle tractor trailer unit amount to $1,582.00.

* * *

Chrysler Corp. is demonstrating a two-and-a-half-ton turbine-powered Dodge truck. The demonstrations took place in Washington early in March in conjunction with the turbine power conference of the American Society of Mechanical Engineers.

George J. Huebner, Jr., executive engineer—Research for Chrysler states, "The Armed Forces already have expressed keen interest in gas turbine power plants for ground vehicles but large-scale production of the new engine is not in the near future."

* * *

Four automotive engineers, all specialists in the field of vehicle exhaust emission control and measurement, were loaned to California by the automobile industry during March to assist in the establishment of testing procedures for exhaust control devices. They are serving at industry expense. The action follows a request from Donald A. Jensen, of the California Motor Vehicle Pollution Control Board.

* * *

All Buick brake drums for field replacement are being coated at the factory with a transparent blue lacquer to protect them from the effects of weather. It is necessary, before fitting a new drum, to clean all traces of the lacquer from the braking surface. The coating can be removed with Methyl Chloroform as a cleaning agent.

* * *

Chrysler is putting out a new model known as the Highlander, with MacDuff tartan interiors. It is available as a sedan or four-door hardtop with silver, grey, black, white or red exterior finish. The MacDuff tartan is a combination of blue, green and red. The new fabric is 75 per cent wool and 25 per cent nylon, which is claimed to be durable and easy to clean. It is used for door trim as well as on seat and back cushions. Seat bolsters are tailored with durable vinyl.

* * *

Provisions for easy installation of seat belts for both front and rear seats will be provided throughout the automotive industry in the 1962 cars. In fact, many of them will make their appearance on cars made during the latter part of the 1961 season. Announcements to this effect have been released by all of the major automobile companies.

* * *

Electric Autolite Co. is completing tests on its transistorized ignition system. According to Autolite reports, the new system offers possibilities for vastly improved life, including a nonfouling, universal heat range spark plug. Other advantages indicated are easier cold-weather starting, with very little current voltage drop-off at high speeds. Autolite states that the new system should be ready for the consumer market during the later part of 1961.

* * *

The ban on speed and endurance testing which led to the elimination of the old established Contest Board of the American Automobile Association, and finally to the discouragement of speed and other tests by the Auto-

(Continued on page 72)

TRAFFIC!

YOU'LL BUILD IT FAST IN YOUR SERVICE SHOP WITH MOPAR APPROVED REMANUFACTURED PARTS

Here is a new business builder for you—with the MoPar APPROVED QUALITY LINE of Remanufactured Parts—for Chrysler-built vehicles. And Rempar Quality Remanufactured Parts for other makes of vehicles.

You don't have to add space and equipment or skilled labor. These fast-moving items install quickly, easily, give the kind of dependable performance that can help to increase your list of satisfied customers.

Here's a way to cash in on the profit opportunity in the older car repair market. You and your customers get a new standard of "QUALITY"—plus a competitive price.

The COMPLETE LINE—MoPar Approved Remanufactured Parts and Rempar Quality Remanufactured Parts—carries a NATIONAL WARRANTY (4000 miles or 90 days) by the MoPar Approved Remanufacturers.

Build business. Satisfy customers. Reach for that phone. Call your MoPar Wholesaler or Chrysler Motors Corporation Dealer now!

NOW AVAILABLE

MoPar Approved Remanufactured Parts for Chrysler-built vehicles, Rempar Quality Remanufactured Parts for other makes of vehicles

6 and 8 cylinder engines
(short and complete)
V-8 cylinder heads
automatic transmissions
fuel pumps
generators and armatures
starters and armatures
voltage regulators
carburetors
clutch assemblies
crankshaft kits
oil pumps
connecting rods
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REMPAR QUALITY REMANUFACTURED PARTS

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of *PERFECT*
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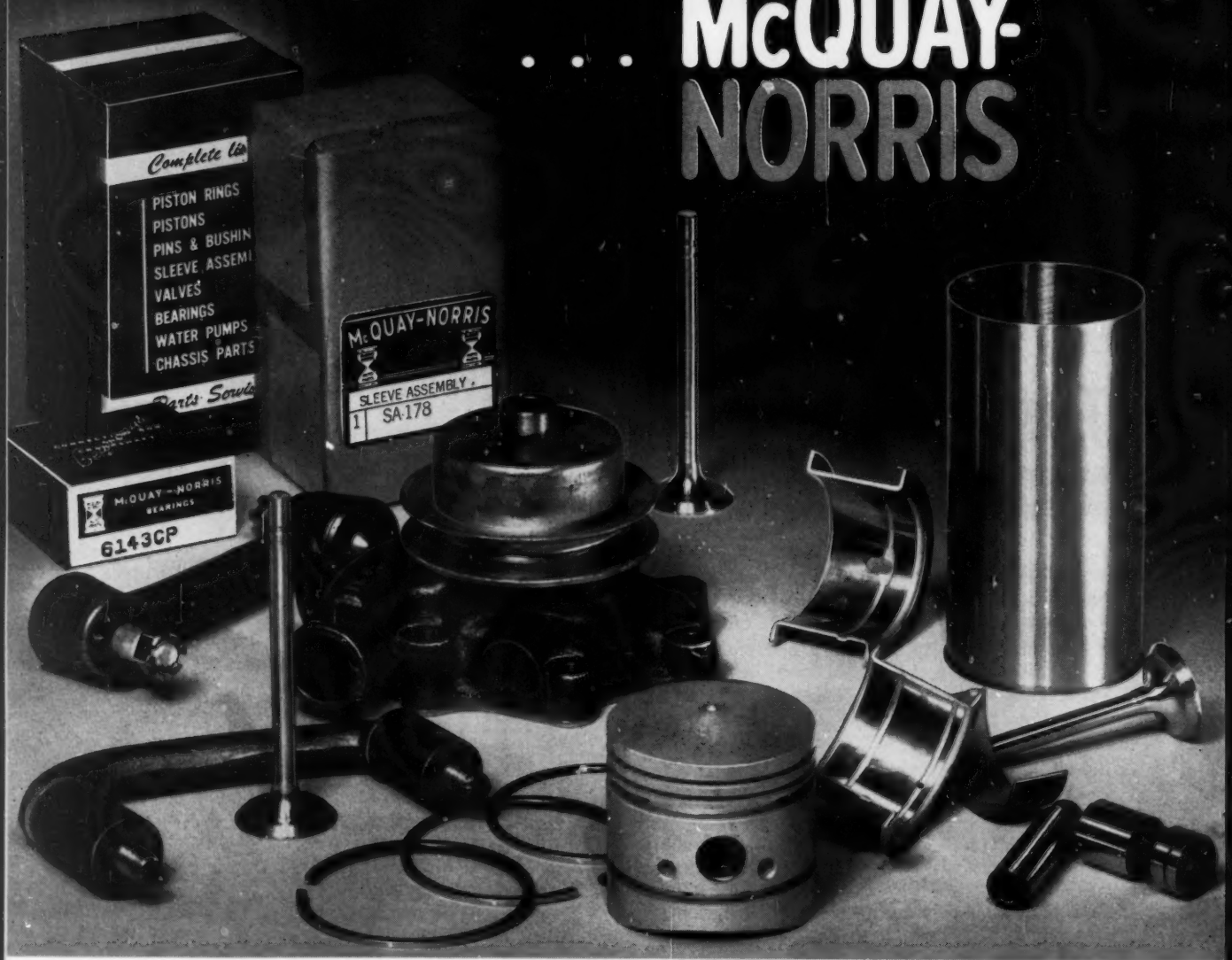
. . . McQUAY-NORRIS



Rings, pistons, pins, bearings, valve train parts, water pumps, chassis parts? All parts in the McQuay-Norris line—designed and manufactured to the same high standards of quality and precision—are known for uniform performance and longer service. Your McQuay-Norris Wholesaler is "replacement parts headquarters" to mechanics all over the country who have experienced the satisfaction of working with the McQuay-Norris line. Use them on your next job.

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Editor's page

Seat belts promote driver-passenger safety

• FOR YEARS airplane passengers have taken safety belts for granted as a natural part of flying. Why not the same acceptance of safety belts to transportation by automobiles?

It has precisely the same reason for being needed. It keeps driver and passengers in their seats—where they belong—in case of sudden violent stops or accidents. Certainly the reasons for keeping car occupants in their seats are valid for motor cars as well as airplanes.

But, seat belts are of no protection unless their use becomes a habit with the driver and passengers. Not only should seat belts be installed, but they should be used, regardless of the length of the trip. Accidents happen just as easily on short half block trips to the supermarket as on long cross-country turnpike trips.

The American Medical Association estimates that some 10,000 lives or more could have been saved last year out of a total highway death toll of approximately 40,000 if the car occupants had been wearing seat belts.

Some months ago, Chrysler Corporation, in a bold move to encourage greater use of safety belts, offered them to its dealers on a non-profit basis and recommended dealers make the belts available to owners of all makes of cars on a similar basis. Only a nominal charge was to be added for installation.

At present, the members of more than twenty state police forces wear seat belts, true also of all state-owned California and New York vehicles.

Many associations, institutions, U. S. Government agencies and others are stepping up the program of educating the driving public in safer driving through use of seat belts.

They're as necessary for safety as brakes are for the cars.

Ben Ikert
EDITOR

The piston—a three-ring circus

This busy and vital part forms a moveable wall of the combustion chamber, allowing volume increase and decrease . . . takes the push of expanding gases to the connecting rod and transmits rod angularity to cylinder side wall.

• THE MECHANIC who does engine work has seen many pistons and has installed many of them in various engine models. But, in common with most of us, he has taken pistons for granted and possibly has gotten into trouble occasionally because he was not aware of some of the facts about pistons that must be considered.

Actually, pistons in an engine are as busy as the performers of a three-ring circus. And there's just as much for spectators—in this case the mechanics—to watch. Piston service is all-important.

It should be appreciated that a piston has much more to do than act as a carrier for rings. Besides acting as a moveable wall to allow increase and decrease of the combustion chamber volume, it has other duties. The piston takes the pressure of the rapidly expanding gas and transmits it to the connecting rod. Also, the piston forms a cross-head by which the side thrust (due to the rod angularity) is transmitted to the cylinder wall.

In substance, the piston changes the combustion chamber into a closed vessel of variable capacity. The piston head, obviously, heats more than the cylinder wall, since it is not cooled by liquid or air. Too, the piston head heats more than the open end since the latter receives heat only by transmission and not by burning gases.

While pistons are made of metal which is solid and strong and very well suited for the use to which it is put, these important engine components are not

These pistons (left to right) are for a chain saw engine, Ford flathead racer, 1959-'60 Pontiac 389 cu. in. engine and a Scott-Atwater outboard engine.

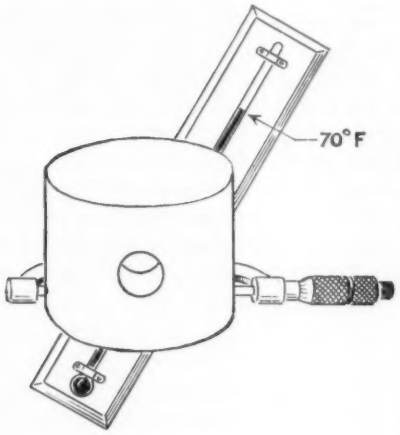
By GUY F. WETZEL
Technical Editor

These pistons (left to right) are for the 1958-'60 GMG 336 truck engine, 1953-'55 Cadillac engine and 1955 Buick engine. The two on the left are of the slipper type. Crowned head on the Buick piston provides clearance for the valves and helps govern compression volume.

as stable as they are generally thought to be. A widely used piston alloy is made up of 9.5% silicon, 3.0% copper, 1.0% magnesium and the remaining 86.5% aluminum.

This alloy, in the castings, is given a heat treatment known as T-5 temper to improve the mechanical properties and to impact dimensional stability to the castings. This treatment consists of artificially aging for 8 hours at 400°F. and produces a hardness of Brinnell 100. A fact that will explain some of the things that happen to pistons in service is that at 212°F. the tensile strength of the metal is 33,000 psi with elongation of 1.5%. At 500°F. the tension strength is 14,000 psi with elongation of 10% and at 700°F. the tensile strength drops to 5,500 psi, with elongation of 40%. In other words, at 700°F. the metal is only one-sixth as strong as it is at 212°F. This will help to explain why detonation has such a destructive effect on pistons.

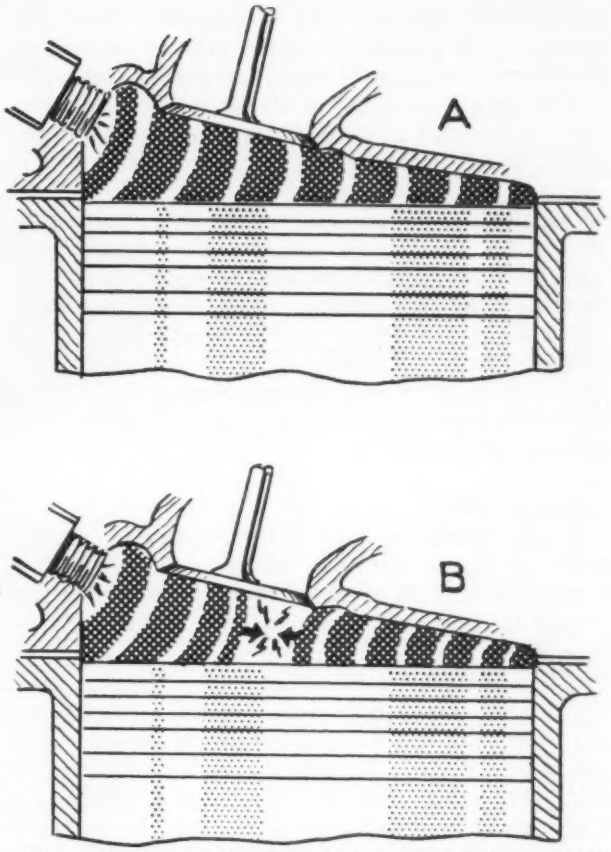
A fact pertaining to temperature which should be known, is that on a 4 in. piston, there will be expansion due to temperature of approximately half a thousandth (0.0005 in.) for each 10°F. above 70°F. Thus, if a piston happened to be sitting in the sun it could easily be heated up to 120°F., which would cause its diameter to increase 0.0025 in. If the piston were measured at this time it would apparently be two and a half thousandths (0.0025 in.) oversize. On the other hand, a piston at 40°F. would be one and a half thousandths (0.0015 in.) undersize.



Piston sizes are factory checked at 70°F., so when miking a piston in service it's a good plan to keep this in mind, since pistons expand at high ambient temperatures.

At the factory where pistons are made, the sizes are checked after dipping them in water which is carefully maintained at 70°F. to be sure that no errors are introduced due to temperature variations. Therefore, be careful not to condemn a piston for not being the exact size specified, within the allowable tolerance unless the measurements are taken at 70°F.

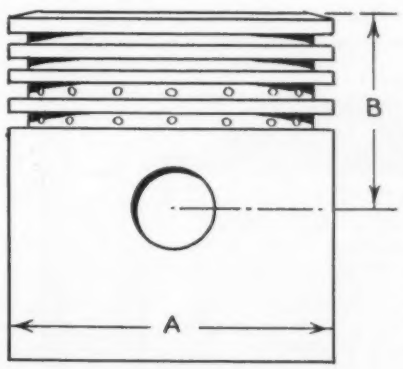
Pistons made with the composition previously mentioned can be bent. If a box of pistons happened to be dropped and given a hard bump especially the slipper type, they may be slightly deformed and appear to be of the wrong size. If this should be the case, the difference between the diameter at right angles to the piston pin and that parallel to the piston pin would be greater than the normal difference due to the cam design.



The normal combustion flame burns progressively across the combustion chamber (A). Detonation occurs when the flame front compresses the unburnt mixture with a resultant spontaneous "explosion" (B).

"MIKING" THE PISTON

When "miking" a piston, the measurement should be taken with the pin removed, as the presence of the pin in the pin bosses may increase the piston diameter slightly. The specified diameter is measured at the skirt on the long diameter, at right angles to the piston pin bosses. When specifying the



Specified piston skirt diameter (A) is measured at right angles to the pin bosses (with pin removed). Compression distance (B) is measured from the pin hole center to top of piston.

compression distance, this is measured from the center of the piston pin or pin hole to the top of the piston.

Pistons are supplied in standard size and oversizes from 0.010 in. to 0.125 in. over, for some engines. When packed at the factory, the weights of the individual pistons are matched within one-tenth of an ounce (1/10 oz.) and the weight is marked on the carton. This weight includes the weight of the pin. They are packed both six and eight in a carton. In some cases, shops doing considerable engine work will use only six pistons out of a set of eight, leaving two pistons over. This is all right, provided great care is exercised when it comes to using them. They should be used only with other pistons of the same weight and oversize.

A CASE IN POINT

A case involving piston size came up recently with one engine rebuilder. He got a complaint that one of his engines operated roughly, so he had the engine brought in for checking. On tearing the engine down and measuring the pistons it was found that one of them was 0.010 in. smaller than the rest. Apparently the supplier of the pistons got one of the wrong size in the carton in spite of the great care practiced. While it was not the fault of the engine rebuilder, except that he should have caught the undersize unit, he had to put in another piston which was 0.060 in. over instead of 0.050 in. oversize. This corrected the trouble and satisfied the customer.

In a few cases pistons have been returned to the factory that are characterized by a cavitated or pitted appearance on the head, as though small bits of metal had melted, been pulled away and then redeposited on the surface. This eroded or pitted area usually starts at the top edge of the top land and works its way down to the rings. In other cases a hole will be eroded through the piston head. The pitted appearance of the piston head is so characteristic that once recognized it can never be mistaken.

When this is encountered the trouble lies not in the piston or improper piston design, but rather in improper operation of the engine. Such failures are not caused by faulty metal or defective manufacture but instead are the result of operation for prolonged periods under conditions of severe detonation (see page 17).

TOP RING GROOVE WEAR

There is one type of light alloy piston where top ring groove wear has been a service problem. This has been the case with some high performance diesel engines where high operating temperatures reduce the resistance to wear and deformation of the aluminum alloy in the vicinity of the top ring groove, permitting this groove to enlarge under repeated hammering of the ring as the engine operates. Distortion of the groove continues until it is enlarged to the point where either functional or physical failure of the top ring occurs.

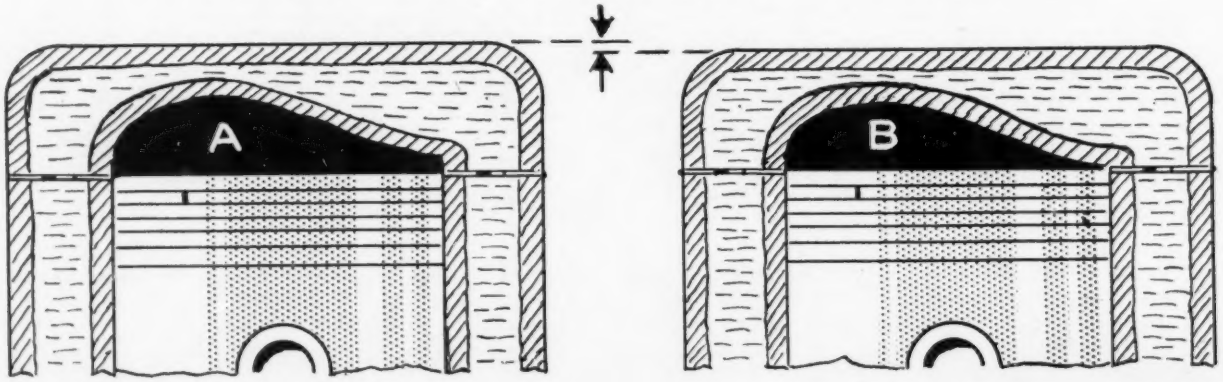
The solution to this problem was in producing an aluminum piston with a band of special cast iron which is cast into the aluminum casting and has a ring groove cut into it. The United Engine and Machine Co., San Leandro, Calif., for example, has succeeded in adapting a process of molecularly bonding the iron band to the aluminum alloy so that successful pistons of the insert band type are produced.

The process of bonding aluminum to iron was originally developed by Fairchild Engine and Aircraft Corp. to combine in their engines the strength and wear resistance of an alloy steel cylinder liner with the heat dissipating ability of aluminum fins. Under this process aluminum is cast around a ferrous metal part which has been tinned with a coating of ferrous-aluminum alloy so that the aluminum fuses with the alloy to present a continuous metal phase between the dissimilar metals without the mechanical separation which has previously characterized previous attempts to cast aluminum around ferrous inserts.

The production of A1-Fin process pistons is accomplished in four steps: (1) cleaning the cast iron insert; (2) tinning the insert; (3) casting the pis-

(Continued on page 18)

Milling a cylinder head or block to eliminate warpage increases the compression ratio by reducing the combustion chamber volume, as shown by the difference between A and B.



Analyzing Piston Failures—*(Courtesy Champion Spark Plug Co.)*

• GREATLY INCREASED compression ratios have led to improved economy and performance in passenger car and truck engines. However, because of these extremely high compression ratios, various forms of abnormal combustion have become more troublesome in present day engines than in their earlier counterparts. These in turn, have caused occasional failure of pistons, spark plugs and other engine parts.

While the various types of abnormal combustion can be mutually inciting, examination of the damaged parts often leads to discovery of the primary source of trouble, and hence, enables the mechanic to correct the condition.

DETONATION OR SPONTANEOUS IGNITION

Detonation generally is thought of as spontaneous ignition of the end-gases ahead of the flame front advancing from the spark plug. This leads to severe pressure fluctuations or "shock waves" within the combustion chamber, causing chamber walls and other parts to vibrate in sympathy. This phenomenon produces the familiar knock or ping which may or may not be audible to the motorist under actual driving conditions.

While sustained detonation produces a general rise in temperatures, with resultant weakening and removal of metal from the piston crown, severe detonation is most likely to hammer a hole through the piston as illustrated in Fig. 1. The hole usually is sharp-edged. Radial cracks and a depressed area may be found adjacent to the actual break.

Fig. 1.

Evidence of excessive temperature can sometimes be seen in pitting of metal on the top surface of the piston. Broken ring lands or cracks in the piston wall also may be in evidence, as indicated in Fig. 2.

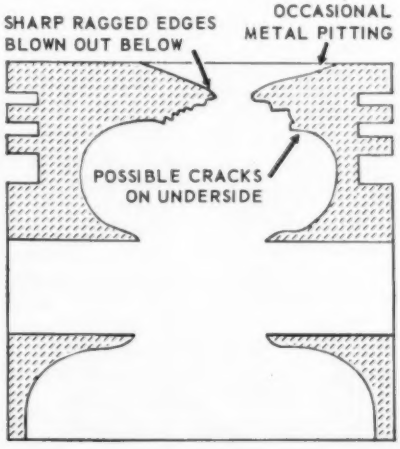


Fig. 2.

When primary detonation damage is indicated, concentrate investigation on: 1. Fuel grade used vs. octane requirements; 2. Basic ignition timing settings; 3. Automatic spark advance; 4. Leaking intake manifold; 5. Cross firing spark plugs.

Fig. 3.

Fig. 4.

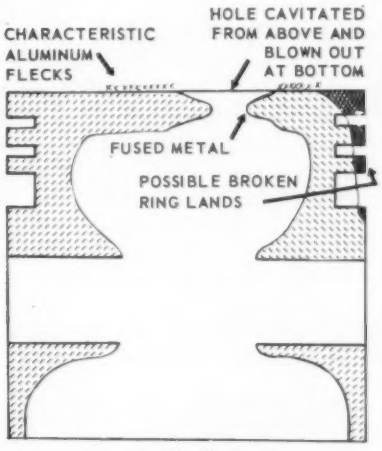


Fig. 5.

PREIGNITION OR SURFACE IGNITION

Preignition or surface ignition is considered to occur when glowing deposits on an exhaust valve or overheated spark plugs ignite the fuel charge before the timed spark discharge. This leads to extremely high temperatures and pressures within the combustion chamber which may in turn incite detonation.

The extreme temperatures associated with preignition generally result in melting of the piston as shown in Figs. 3 and 4. The edges of the breakthrough illustrated in Fig. 5 indicate a typical thermal failure unlike the mechanical failure caused by detonation.

When primary preignition damage is indicated, check for the following: 1. Valve tappet adjustment; 2. Amount of combustion chamber deposit; 3. Spark plug heat range; 4. Condition of cooling system; 5. Ignition timing.

Pistons . . . *(Continued from page 16)*

ton; (4) heat treating. These pistons have been field-tested so that they can be used with confidence by operators of engines which have had short lived pistons due to top ring wear. These pistons are considerably more expensive than those made of ordinary aluminum alloy, but they are economical to use considering the extended engine life and reduced servicing costs.

DESIGNS AND SIZES VARY

Pistons are made in a wide variety of designs and sizes. The sizes range from those suitable for chain saw engines and power mowers up to large diesel engines. The selection of the correct piston for any given engine is simple—merely give the parts house the name, year, and size of the engine to be supplied. However, it is necessary to specify whether standard size or over-size pistons are wanted and the amount of oversize, if any. Engines are generally rebored to take a predetermined over-size piston with the correct clearance, depending on the amount of cylinder metal it is necessary to remove to get the desired cylinder wall finish, round and true, and free from score marks or other defects.

Practically all currently used pistons are cam turned or ground. This makes the cross section of the piston skirt slightly eliptical with the diameter at right angles to the piston pin from 0.010 to 0.022 in. larger than the diameter parallel to the piston pin. This allows the pistons to have a minimum clearance on the pressure surfaces without any danger of the piston becoming tight and possibly binding when it expands as it heats up in service. Most of the pistons are lightly tin plated or graphited as a precaution against seizing when newly installed.

Pistons are manufactured to very close tolerance. Piston pins are generally fitted to a clearance of two tenths (0.0002 in.). The tolerance on groove widths is +.000, —.001. As the clearance allowed between ring and groove side is .002 to .003 in. the rings will always fit.

The skirt clearance between piston and cylinder wall is generally figured at 0.06% of piston diameter for automobile engines and 0.1% for heavy-duty pistons. This amounts to 0.0024 in. for automobiles with 4 in. pistons or 0.004 in. for heavy-duty engines with the same size pistons.

Pistons for use with full floating piston pins must make use of lock rings to retain the pin in the piston and prevent it from scoring the cylinder wall. Oscillating pins are locked in the rod upper end by being pressed into place.

Sturtevant Designs Special Scale For Golden Torque Wrench Award

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TORQUE WRENCH
NATIONAL HOT ROD ASSOCIATION
DEDICATED TO SAFETY
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CLASS
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The P. A. Sturtevant Co. have designed a special scale for use on their golden torque wrenches which are awarded to the chief mechanics of winning cars in drag racing events throughout the country.

The special scale was designed in cooperation with the National Hot Rod Association, and bears its crest in full color. Space is also provided for an engraving to identify each class winner in each event.

Gold torque wrenches manufactured by Sturtevant have been awarded in numerous major racing events like Sebring 12-hour Race of Endurance, Indianapolis "500", Detroit National NHRA Drag Race and at Riverside, the Grand Prix.

Before Condemning Dashpot Make the Following Checks

There are many areas of the engine which contribute to the condition of the engine failing to return to the same idle speed every time. Before condemning the carburetor dashpot and replacing it, check the following:

1. The carburetor throttle plates for a sticking condition.
2. The carburetor throttle shaft for binding due to gum, dirt deposits, and/or excessive wear.
3. The carburetor linkage at the carburetor, the bell crank linkage at the fire wall, and the accelerator pedal for binding due to dirt accumulation, bent out of position, retaining clips installed incorrectly, and/or rubbing on the floor mat.
4. The carburetor dashpot stem for proper alignment with the carburetor throttle lever.
5. The dashpot to throttle lever clearance; the throttle return spring for correct retention, length, diameter of wire and position.

Correct any discrepancies found and check for proper throttle return operation before replacing the dashpot.

Correct Alignment A Must When Replacing Alternator Drive Belts

Belt alignment is a very important factor in the life of alternator drive belts, according to a recent Chrysler Corp. Service Bulletin. Therefore, when a belt is replaced the following precautions should be taken:

● Assure that the maximum misalignment of the belt does not exceed 1/16" per foot of belt between wrap centers.

● It should also be assured that no misalignment exists in respect to the center lines of the alternator, crankshaft and water pump pulley. Where misalignment does exist, it is generally caused by a force being applied to the rear of the alternator when the belts are being tightened. When a force is applied at this location, it causes the alternator to cock.

When adjusting the alternator drive belt, the force should be applied as close as possible to the adjusting strap.

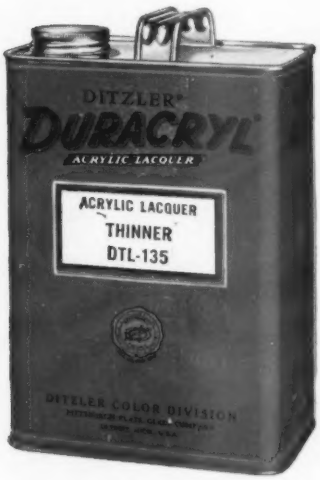
● When adjusting the alternator drive belt, it should be tightened to a point that the belt will not slip when attempting to pull the belt through by hand. Adjusting in this manner will provide maximum belt and alternator bearing life.

Have you Used Equipment for Sale?
Use our Classified Columns—Page 80

DITZLER OFFERS 3 outstanding thinners for better repair of acrylic finishes!

DTL-135

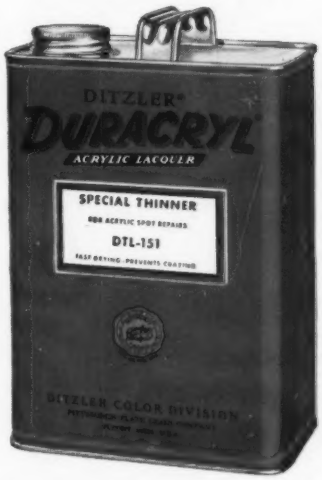
High-Gloss Acrylic Thinner



Allows acrylic to atomize and flow out properly, helps eliminate orange peel, and provides good gloss. Excellent for touch-up repairs or complete finishing. Also mist coating.

DTL-151

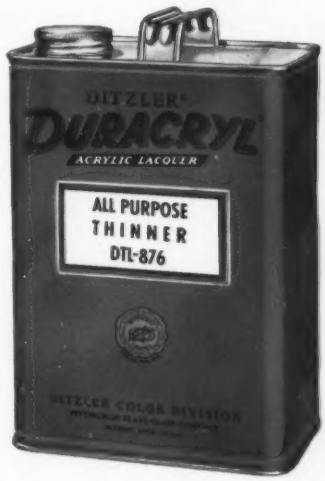
Non-Penetrating Acrylic Spot-Repair Thinner



Specially designed for spot repairing of acrylic colors to cover up cracks on black and other weathered colors or lifting around featheredges. Has exceptionally fast drying properties.

DTL-876

All-Purpose Thinner



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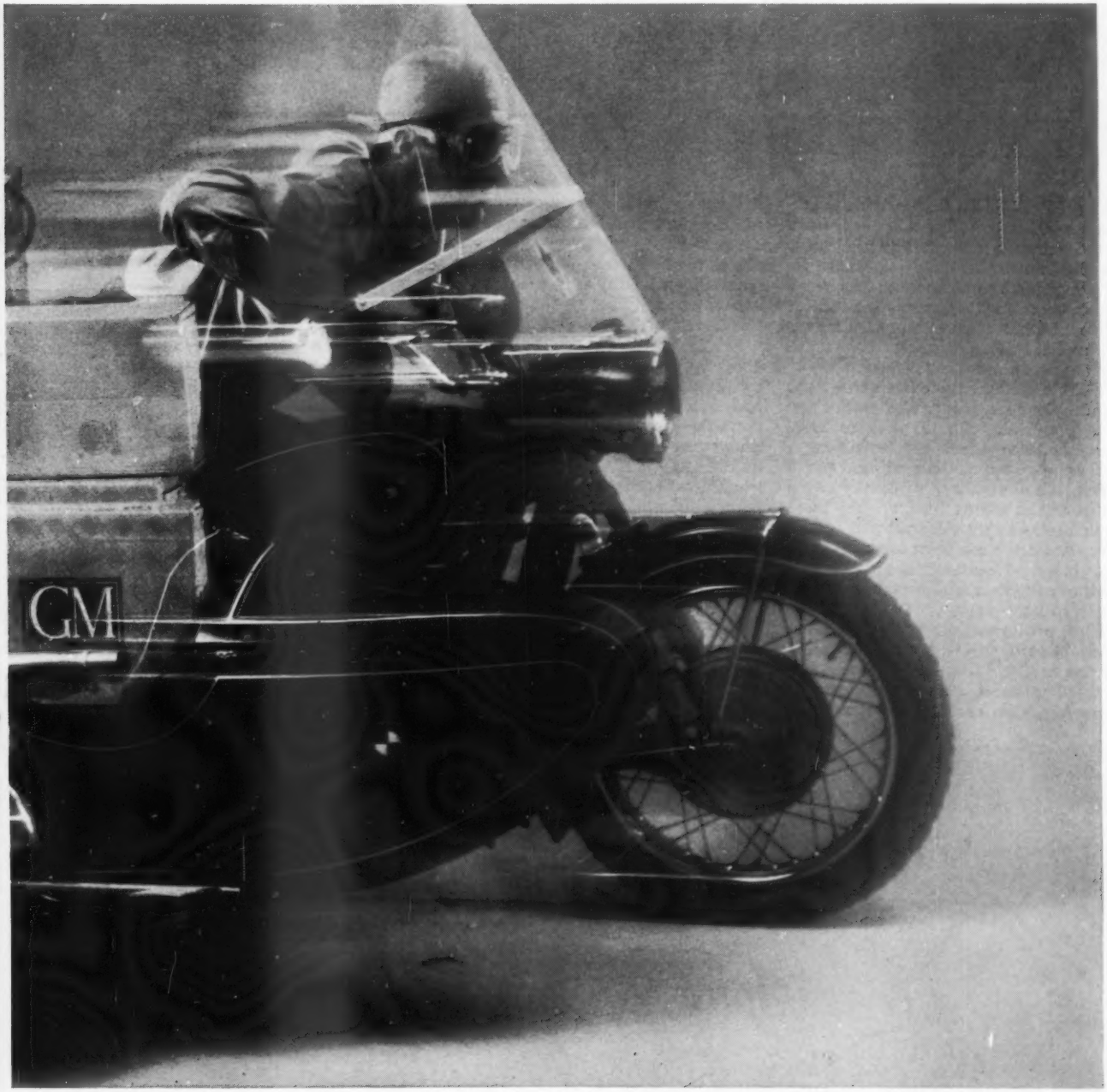

BODY REPAIR . . . REFINISHING . . . GLASS . . . TRIM

The body shop

APPEARANCE MAINTENANCE

Collision damage repair on the 1960 Valiant

●IT'S BEEN SAID that an automobile body man or metal worker can be a sympathetic friend to any mechanic in most any other trade—because he has engaged in a piece of almost every other trade in his work. As a matter of fact he has often been complimented for his skill in these various trades by the tradesmen themselves.

Skilled welders have been surprised at the smooth, controlled welds on thin materials, cabinet makers have complimented them on the strength and appearance of their sill and panel work, plumbers have said they could learn tricks about lead wiping from their metal filling. Aircraft and upholstery workmen say their fabric patches are okay. Necessity has been the mother of invention down through the years of body repair.

The evolution of the automobile body has not been as clearly defined as one might think. There wasn't exactly a straight step-by-step growth from horseless carriages, which were little more than a spring buggy with an engine instead of a horse, down through steel and hardwood combinations, then all-steel, all sitting on a frame foundation, and then unitized construction where the orthodox frame is omitted.

As far back as the first electric starter, about 1912 or 1913, some automobiles were equipped with all-steel bodies, with nary a stick of wood in the sills or the floor "boards." Drumming was quieted by the simple expedient of pouring a few quarts of granulated cork between the body panels. Several decades passed before the "new" all-steel bodies as we know them now became standard.

But in between these periods there were bodies made with aluminum panels, hardwood has been used for stationwagon construction, and hardwood encased in steel combined to make sills and posts that could be proven to be "stronger than a solid bar of steel of the same dimension." Some few cars were built to order in the 20's, with leather stretched over hardwood frames to make a handsome sedan body, and even more unique custom construction has been done when enough money was laid on the line. All during this time the unitized body-and-frame combination construction was moving into the picture in isolated locations and by a few manufacturers. The problem of their repair was getting more consideration from the metal and frame mechanics in the body shop than it was by the vehicle manufacturer or the tool industry.

Fig. 2. A body clamp such as this should be fastened in the area of the door pillar, although it may be moved forward or backward as required.

Fig. 1. Hook-up which was used to pull out the bumper for easier removal.

In various independent and dealership body shops the ingenious mechanics were devising rigs that would help them put the unitized body back into use when the early method of lifting off the body, straightening the frame, then remounting the body and

Fig. 3. Pushing against a steering gear mounting post to bring the fender forward and upward.

Fig. 4. This illustration shows the damage that was inflicted to the box-section rail.

shaping it could not be accomplished. While they were working their shop-made rigs which gave them an "external pull" instead of an "internal push" effect in bringing the job back into shape, the wheels in their heads began turning to recognize that they were reversing the direction of force, but along the same line that put the kink in the body. And this was exactly what they were accomplishing by their previous, more round-about methods of repair, but it was taking more time.

So it naturally came to pass that the "external pull" method they were using on these unitized bodies was found to be adaptable to conventional bodies and fenders to create better working areas while applying pressure and to save time.

In many cases the rigs devised in the shops consisted of anchoring rings strategically spotted about the floor and on building uprights. Logging chain tighteners or light hand hoists were used to shorten the chains and apply the required force in the appropriate direction by anchoring the chains in anchoring rings and clamping the other end to the damaged body. One veteran body man in the West had his boss so well sold on this method of straightening by external pulling methods that when he constructed a new body shop over ten years ago, he had such anchoring rings built into the walls and floors to the mechanics's requirements as part of the building design.

Coupling this external pull with internal "push" pressure applied with hydraulic ram combinations often reduced normal working time by many hours per job, besides producing a better repair. The conventional hydraulic ram pulling devices were of course used in the appropriate short pulls as usual, on either frame or body sheet metal section repairs.

Now, with commercially designed machines for externally pulling both light and heavy metal sections into shape, the body shop mechanic has a wider selection of clamping devices, etc. than before. Several portable models, as maneuverable as a floor jack, provide pulling force angles from any direction and at any level with closely controlled pressures that can be varied as the job progresses.

Each collision job repair must be carefully analyzed in advance by the mechanic who decides what steps he will employ and in which order, so that each operation will not interfere with those that are known to follow in progressive order. In so doing he is mentally reconstructing the sequence of damage occurrence in the accident itself.

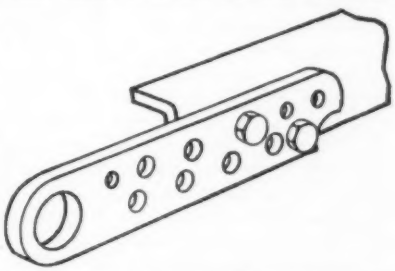

Fig. 7. A convenient and effective way to fasten to the front of the frame is by use of a pull plate, shown above. The bumper bracket bolts hold it in place; two will do, but three are better.

With a mental picture of the direction of impact or forces that caused

Fig. 5. Rail damage was emphasized when the self-centering alignment gauges were installed.

Fig. 6. First hook-up used with a pull plate to move left front rail downward and forward.

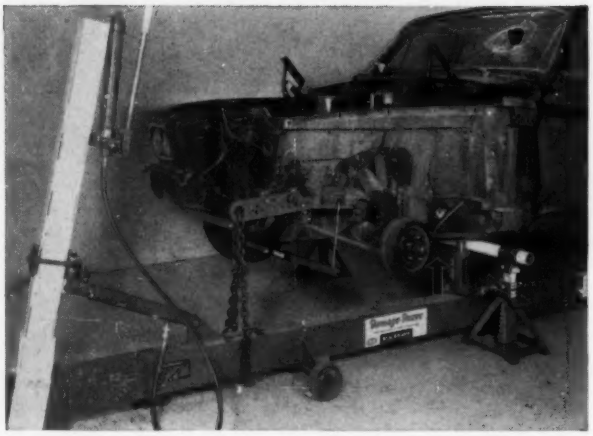

Fig. 8. Second hook-up on the left front rail. Note position of the chain and hand jack.

each type of damage, the repair forces can be applied in reverse order from the same direction to begin the shaping of the supporting members and the sheet metal. Thus, the return to the original contour of each part can be accomplished without adding damage to damage, or causing stretch or kinks in the metal.

Time is the commodity the body shop sells when the vehicle is readied for return to the owner. Two identical jobs may be delivered to owners who are pleased to get perfectly repaired cars back from their shops. But from the shop operators' standpoint these identical jobs may represent a successful job on one hand, while the other may be considered a failure.

This is simply because they were bid in at similar figures, but one was completed in time to make a profit on the job, while the second moved down the line a few hours slower, and its delivery represented a financial loss.

For this reason the most skillful operators can only be successful in the business if they make use of the advanced methods and machines for helping control the time element while simplifying the job.

* * *

In previous issues, AUTOMOTIVE SERVICE DIGEST has dealt with basic fundamentals of metal working along with frame and unitized body construction. This month's article concerns collision damage repair, front and rear, of two 1960 Valiants.

And now, let's take a close look and see how specialized equipment, along with the necessary know-how tackled the front and rear damage on the two Valiant cars. The material and illustrations were furnished through the courtesy of Blackhawk Mfg. Co.

The car with severe front end damage, as noted in Fig. 1, was first placed on safety stands and cross tubes to make it level and bring it to a comfortable working height. It provides clearance for use of equipment and inspections, and measurements can be made more easily. A pair of underbody clamps, Fig. 2, were anchored to the pinchweld flange on the rocker panels. A pipe was put between them to distribute the load. A dozer was next anchored to push against the pipe.

To pull the bumper out for easier removal, the hook-up in Fig. 1, was used. The same type of anchor was used to make pulls by use of a sheet metal clamp.

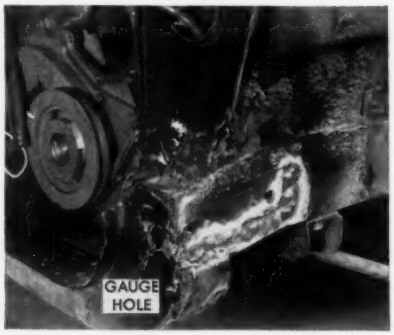

Fig. 9. Lower left shows one of the gauge holes used for hanging the alignment gauge.

A hydraulic ram was used to push the fender forward, with the dozer pulling forward at the same time. Pushing and pulling the fender forward and upward helped to straighten the fender shield. The push was against one of the steering gear mounting bolts in the side rail, Fig. 3. (*Caution:* Never use the front suspension as a means of pulling or pushing.)

With the grille, radiator and hood lock removed, further inspection showed that the water pump pulley hub was driven rearward on its shaft. The fan blades also were bent.

The left front fender extension, headlamps and parking lamp were next removed. The wire harness was damaged beyond repair, and inspection showed this as headlamps were removed. At this time, the fender-to-fender shield attaching bolts also were removed. The fender side shields are welded to the front rails, to the dash and to the radiator yoke. Most of the impact force on the front end was absorbed through this rigid assembly.

Damage to the rail is evident by reference to Fig. 4. It was emphasized when the self centering alignment gauges were installed. The results are shown in Fig. 5. Close inspection showed damage to the rail just forward of the cowl panel and to the left front side rail, which was bent upwards slightly. Diagonal checks helped determine that the front rails were in correct location with respect to the centerline of the car within specifications.

The hook-up for pulling the left front rail downward and forward is shown in Fig. 6. A pull plate, Fig. 7, was bolted to the side rail at the bumper bracket mounting holes. A hydraulic jack was placed below the cowl area just to the rear of the damage area. The exact location of this varies with the damage and metal which needs to be straightened. A chain was used to connect the pull plate to the dozer in such a way as to provide both a forward and downward pull. The forces were then carefully applied. Additional pulls may be made if the first does not completely correct the damage. Alignment gauges are moved to various positions as the work progresses, to make sure all parts are in their intended position.

(*Continued on page* 28)

Fig. 10. After final painting and assembly the front end was restored to its original appearance.

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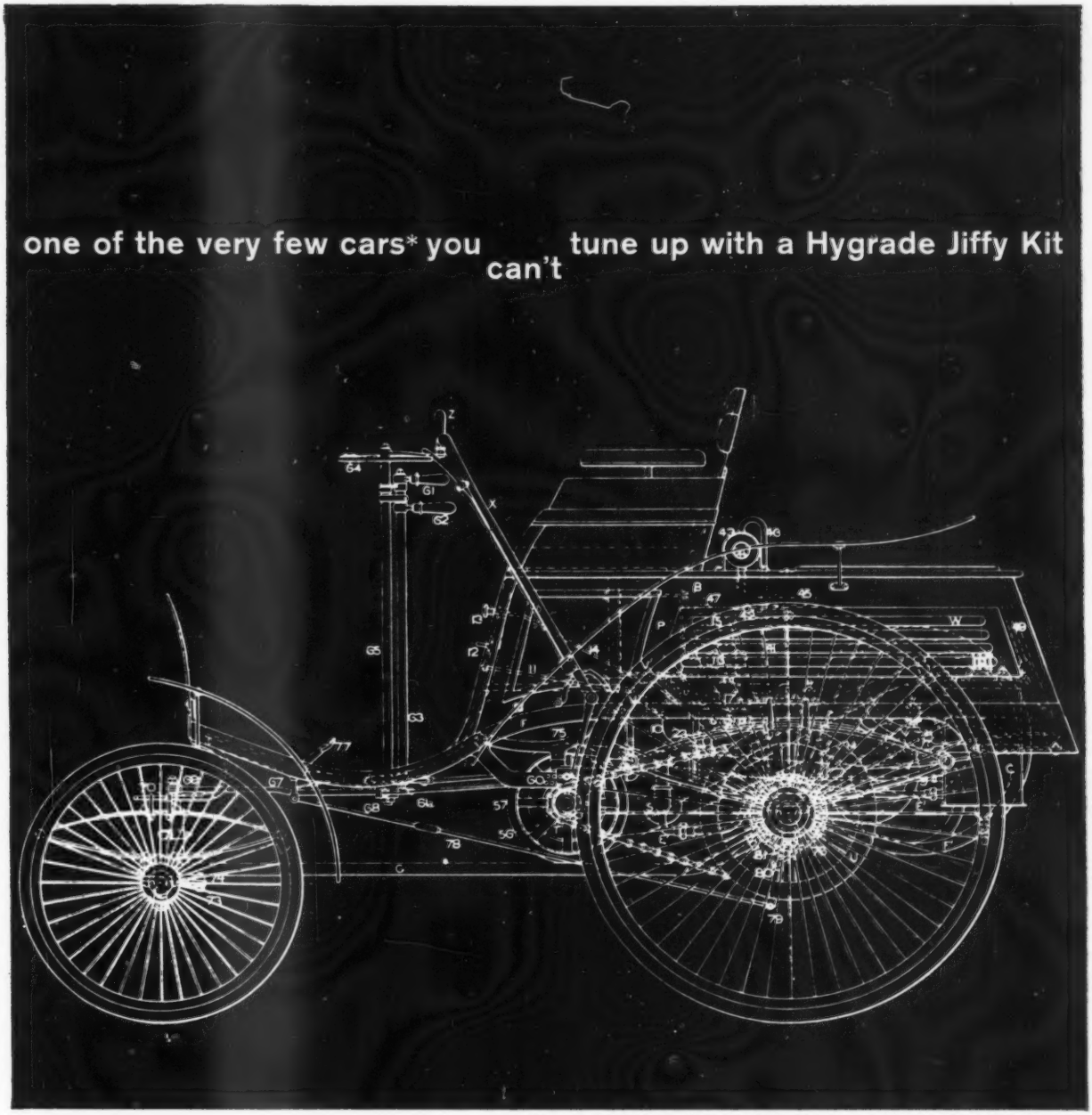

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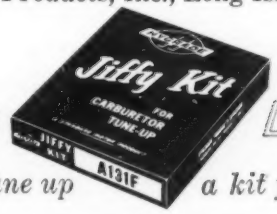

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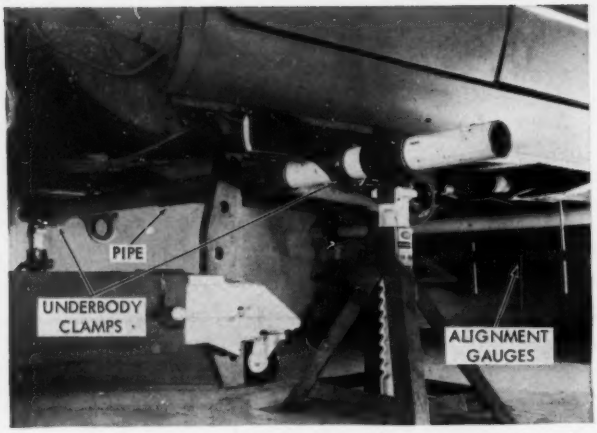


Fig. 11. Close-up of anchor clamp attachment, connecting pipe and reinforcing pipe.

Fig. 12. A Dozer in action on the first pull to get the bumper out for easier removal.

Fig. 8 shows the second hook-up and the position of the chain and hand jack will be noted. To move the front rail into alignment, heat was applied to the inner and outer sides of the front rail; at the same time, the hydraulic jack located just forward of the cowl was raised.

Shown in Fig. 9 is one of the gauge holes used for hanging the alignment gauges. The front section of the rail was pushed inward by the front bumper bracket at the time of impact. It was necessary to apply heat and use a tool through the gauge hole at the front of the rail to pry the outer part of the box-section back into alignment.

It was determined that the front cross member had been pulled back into place by the straightening operations on the side rail. The radiator yoke was also checked and straightened by minor repairs.

Because of easier access to the areas in which they are mounted, the water pump, fan, drive belt and horns were next installed. Then, the new left-front fender, fender extension, air deflector and the hood were put into place. This was done to align the hood and left-front fender with the cowl and the left-front door. The left-front wheel and tire were next installed and the car was lowered to the floor. With correct body alignment the sheet metal and replacement parts will fit correctly. This was true in the case of the Valiant as evidenced by reference to Fig. 10.

REAR END DAMAGE REPAIR

Shown in Fig. 11 is a close-up of the attachment of anchor clamps, connecting pipe and reinforcing pipe. The anchor post of the dozer is in position to push against the reinforcing tube. There is ample clearance to read the aligning gauges, for maneuvering the dozer and making tram measurements. The dozer is in action, Fig. 12, on the first pull to repair the rear end damage. A pull chain is being used to pull the bumper out for easier removal.

The inside of the trunk, Fig. 13, had one side pushed back 9 in. and the other pushed back 2 in. A close-up of the damage to the right side rail is shown in Fig. 14. (The left side had similar damage.) Note how badly it is buckled and kinked. The pull to begin the repair was made while the quarter panel was still attached in order to provide a means of pulling out some of the other damage. This also provided a convenient means of attaching the pull equipment. A hydraulic ram was used as an aid in removing the kink and buckle; it was placed just forward of the rear spring hanger to permit pushing up on the rail. A pull force was applied with a dozer at the same time.

The dozer was moved to several different positions as the damage was worked out. This was possible by using underbody anchor clamps, cross tubes and support stands.

Fig. 15 illustrates an excellent example of the use of hydraulic power to assist in working out damage of this type. Note that the door alignment is much improved and the buckles removed. This is the right-rear wheel house.

A downward pull was applied to the right-rear quarter panel, Fig. 16. Again, hydraulic power assisted between the inside of the quarter panel and the rear floor pan extension. A hy-

Fig. 13. Inside the trunk one side was pushed back 9 in., the other side was pushed back 2 in.

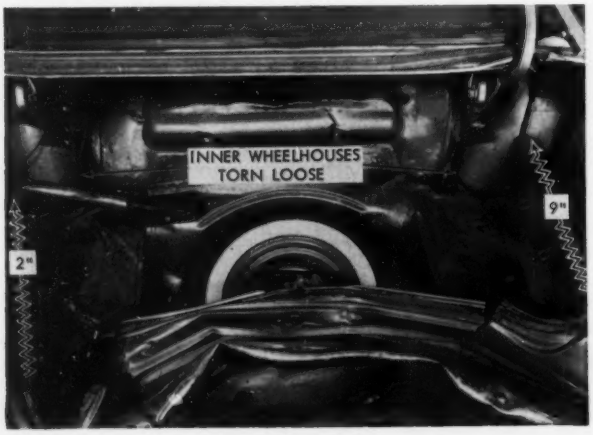
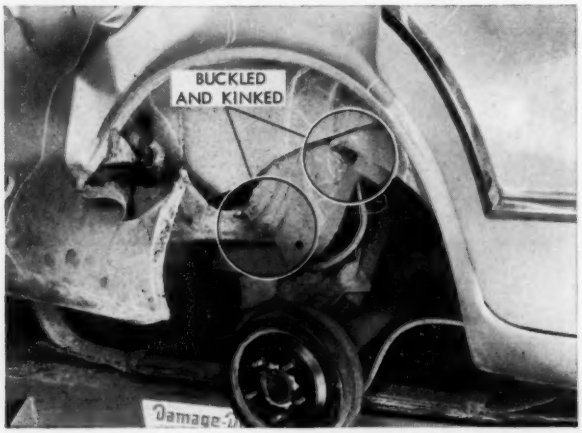


Fig. 14. Close-up of the damage to the right side rail. Left side had similar damage.



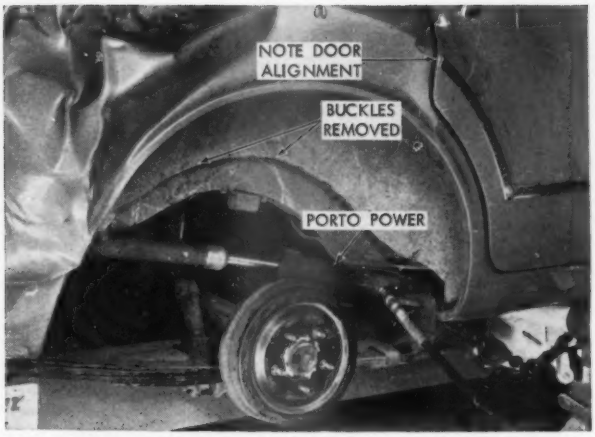


Fig. 15. Example of using hydraulic power to help in working out damaged area.

Fig. 16. Applying a downward pull to the rear quarter panel with two additional hydraulic power assists.

draulic jack was positioned under the right-rear rail just to the rear of the kick-up. A pull plate and eye bolt was placed inside the tail light opening to provide a means of attachment. Although this description covers roughing-out of the rear-right quarter panel section, the same general procedures apply to the left-rear quarter section. It is well to remember that this repair was made by working back and forth from one side to another—not through just a single pull on one side followed by one on the other.

Fig. 17. Inspection showed that the rear floor pan and extensions needed rough hammering for further aligning.

Following the roughing-out alignment of the rear cross-member, inspection revealed that the rear floor pan extensions required some rough hammering to further align the damaged metal, Fig. 17. This was done to complete the roughing-out alignment operation. Work had now progressed far enough to permit removal of some of the structural parts that had been left on as an aid in attaining the rough alignment.

In the damage estimate, it had been determined that replacement of some of the parts would be more economical than repair. Fig. 18 shows the left-rear quarter panel removed. It was cut loose with an air chisel at the sill panel, pillar post, wheel house, floor extension and the top panel. The same procedure was used on the right-rear quarter panel, the extensions and rear stone shield Fig. 19.

Fig. 20 shows the beginning of the replacement procedure. Note the reinforcing plates welded to the damaged areas on the rails. Alignment gauges were used to insure correct location of the parts. Diagnonal and gauge hole measurements were also frequently made to check alignment of repair parts. The quarter panels and floor pan extensions were installed simultaneously, even though they are separate pieces, to insure correct fit. The remaining parts were installed and tack welded where possible with final fit and location checked as each final weld was made.

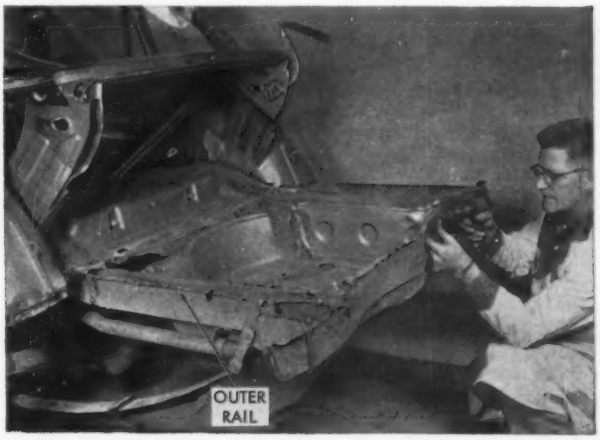
The final welds of the floor pan are shown in Fig. 21. It should be remembered that glass openings and door and deck lid fit should be checked before and during final welding.

The final result of the repair is shown in Fig. 22. Close inspection revealed that the rear doors, rear quarter windows, and quarter panels were in correct alignment. The tail light and bumper fit was excellent, true also of the quarter panel and window fit. The opening between the quarter panel and rear door was to specified clearance.

Blackhawk Mfg. Co., with years of body experience in collision damage repair gives the following information on the effect of a collision on a unitized body.

Fig. 18. Left rear quarter panel was removed with an air chisel for subsequent replacement of some parts.

Fig. 19. The right rear quarter panel, extensions and rear stone shield also were removed.



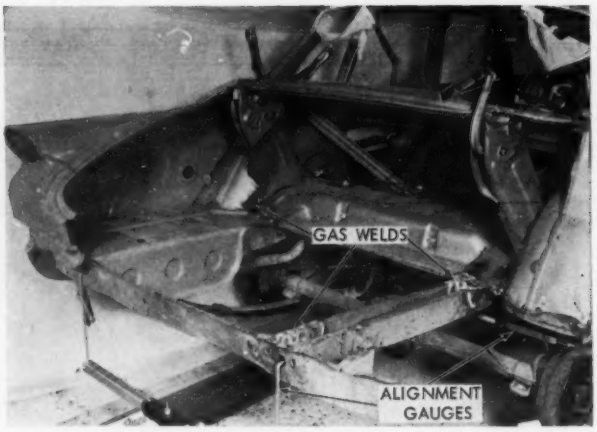


Fig. 20. Beginning of the replacement procedure. Reinforcing plates were welded to damaged areas on the rails.

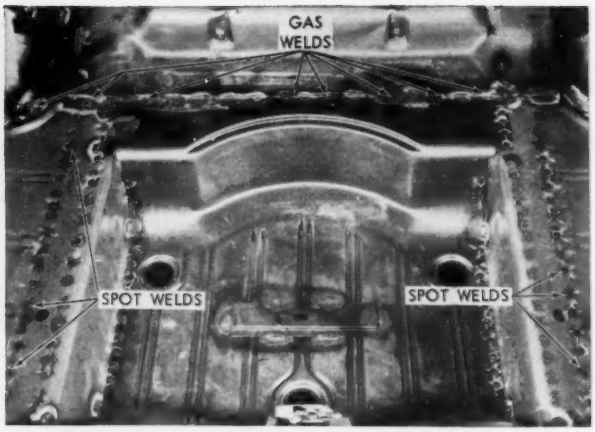


Fig. 21. This illustration shows the final welds that were made on the rear floor pan.

Fig. 22. The final result. Close inspection showed parts in alignment and up to specified dimensions and clearance.

When this type of vehicle is struck in a collision the results are somewhat like hitting an egg carton. The damage is generally confined to the area of impact since the many thin layers of sheet metal absorb the shock. The thin sheets will tear, crumple and wad and this confines the damage to the area in which the unitized body was hit. The damage seldom extends past the mid-point of the car from a collision at one end. This type of body does not assume a "diamond" shape when hit and a true twist condition is extremely rare. Most of the damage will consist of sag, kickup (or kickdown) mashing and buckling of sheet metal.

In contrast, the conventional body, mounted on a frame will become distorted over the entire shell as the frame distorts. A collision which results in a diamond frame will cause damage at a point far removed from the impact. An example is faulty rear door fit resulting from a front end damage. In addition, a diamond condition or sway causes misalignment of the entire running gear system.

Since there is no frame, the whole job is essentially a body job. There is no separation of work into frame repair followed by body repair—the whole job is planned as one. Large stationary machines which are ramp or pit mounted preclude the possibility of easy access to the body. The dozer with its practical method of mounting the car on low stands keeps the body-man with his feet on the ground with easy access to all sections.

In pulling sheet metal, do not apply all the force at one place at one time. Spread the restoring forces—pull at one place, and then, without shifting the set-up merely change the attachment point and pull at another. In repairing front end damage, a wheelhouse panel is roughed out by pulling first at the top and then at the bottom. Also use other tools such as the hydraulic ram to assist by applying two or more forces at the same time so they help each other in working the panel back into place. Hook-ups are fast, simple and easy with the dozer as the equipment can be easily maneuvered around the job.

"Snap-Crackle-Pop" Heard When Manifold Cools Off

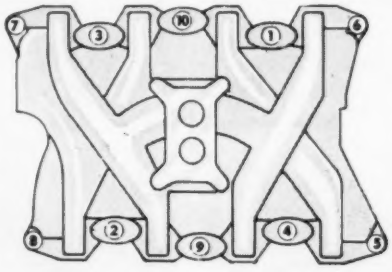
If the owners of a 1960 Dodge 6-cylinder engine complain of a snapping or popping sound when a hot engine is allowed to cool, it is generally due to contraction of the manifolds at the intake-to-exhaust manifold gasket.

To overcome this complaint, the factory has released an improved intake-to-exhaust manifold gasket (Part No. 2206120) which has two additional anchoring tabs.

When installing the gasket, a thin coating of MoPar Lead Plate should be applied to each side. This coating material allows movement of the manifolds during heat contraction and expansion to prevent the snapping noise and it also prevents movement of the gasket.

New Tightening Sequence Improves Manifold Sealing

In order to improve the intake manifold sealing on 1958-'61 Lincoln and Lincoln Continental 430 C.I.D. engines, a new bolt tightening sequence has been released (see illustration).



The use of this bolt tightening sequence is recommended for all operations involving manifold installation. Torque specification for the attaching bolts remains 25-28 lbs. ft.

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Will single-leaf springs appear in '62?

A first cousin to the torsion bar, this controversial suspension system has again come to the front as a contender for possible use on certain '62 cars.

● OVER THE PAST ten years the question of the single-leaf spring has bobbed up and then disappeared only to again show its head after a time interval had passed. It is once again in the limelight, at least in certain circles.

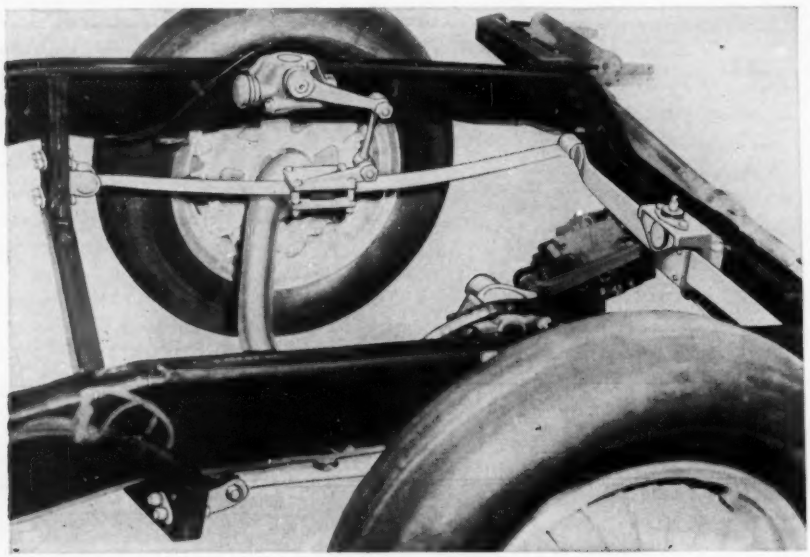
Searching back in our memory, the first time we can recall the application of the single-leaf spring was on some of the General Motors "dream cars." The Firebird, with its sensational turbine engine had such a spring and now there are reports of so-called engineering crash programs at some of the factories to develop such a suspension.

AKIN TO THE TORSION BAR

The single-leaf spring is not a leaf spring at all, but it is a first cousin to a torsion bar, except that the flexure is developed vertically instead of in a twisting action. In both the torsion bar and the single-leaf spring one of the major factors in the action of the orthodox leaf spring suspension is eliminated. That is, there is no such thing as inter-leaf friction to dampen the natural rebound after distortion. This job has to be completely taken over by the shock absorber equipment just as it does in coil springs.

With modern multi-valve shock absorbers the problem of controlled damping of the spring action is much more readily solved than in past years. In fact, it would not be surprising to find that the improvement in shock absorbers may have again led in some degree to the consideration of the single-leaf spring. One engineering writer recently went so far as to predict that the single-leaf spring will make its appearance on certain 1962 cars. The company mentioned in this connection so far has denied any such intentions but it is a well-known fact that it has been working on this development for several years on a strictly experimental basis.

Single-leaf spring rear suspension as used in the GM Firebird I (1954). Note cam and lever shock absorbers and roll balance beam at rear.



SEVERAL BASIC ADVANTAGES

The single-leaf spring has certain basic and important advantages which make it appear logical that such a development would interest a quantity manufacturer. In the first place, this type of spring would be less expensive than other types. Characteristics of the spring itself can be more readily controlled and there are interesting possibilities in connection with the layout of the propulsion of the car which could simplify the entire rear end chassis design.

An advantage of the leaf spring is its ability to maintain longitudinal alignment without the necessity for additional radius rods. It also offers a far greater contribution to lateral stability than the coil spring, although there is no question of the fine suspension capabilities of the coil coupled with the advanced type of shock absorber, plus supplementary supporting members.

The single-leaf spring with its tapering section being thicker at the center and thin at the ends can provide a graduated type of ride meeting conditions resulting from varying types of road. It will require, however, a shock absorber design capable of controlling flexure and recoil rates to meet the requirements imposed by various varieties of road surface.

One of the old bugaboos of the multi-leaf spring was the fact that the termination of each leaf provided an abrupt change in the assembly section thereby creating a line of weakness at that particular point. The tapering form of the single-leaf spring would not have any abrupt changes in section and consequently would be free

(Continued on page 36)

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Single-Leaf Springs . . .

(Continued from page 32)

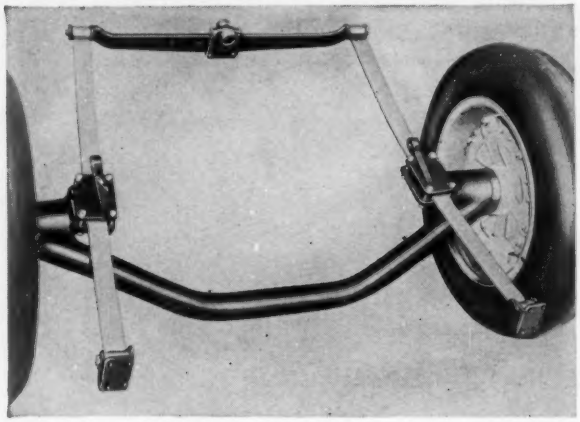
from the lines of weakness inherent in the multi-leaf spring.

The characteristics of a single-leaf spring are governed by the varying thickness of the leaf from the center to the extremities or it can also be varied by the width of the metal at different points along its length.

In connection with the introduction of the single-leaf spring, there are many problems to be solved which cannot be answered without experimentation. One of these is the initial set of the spring, whether it should be horizontal or curved, allowing, of course, for the weight of the car. The multi-leaf springs in late years have been practically horizontal under normal car load. This, however, is a debatable point as the matter of possible reversed curvature on deflection develops some situations which require considerable study.

ENTIRE SPRING TAKES THRUST

The fact that the single-leaf spring could have a much greater factor of safety than the multi-leaf is a point in its favor. This arises from the fact that, as mentioned, there are no abrupt changes of section and consequently no serious fatigue problems introduced by normal flexure over a long period of time. It is more suitable for taking on the duty of propulsion since in the case of the multi-leaf spring, the drive is taken through the main leaf alone whereas in the single unit spring, the entire spring is operating to take the rear wheel thrust.



Transverse balance beam at rear connects the two single-leaf springs.

In spite of the fact that the type of spring under study has a single leaf as compared with four or more leaves in a multi-leaf spring, there are many similarities. The single-leaf spring will, of course, be held at or near the center of its length with a spring clip similar to that used with the multi-leaf spring with its two U-bolts, but there will be no need for any auxiliary means of holding alignment of additional leaves. If the Hotchkiss drive is employed, there will be a rear shackle permitting the longitudinal travel required in this type of suspension.

There will also be a reduction in the unsprung weight which should be helpful on riding qualities. Another consideration is that on the multi-leaf spring much of the action under boulevard conditions comes from the tips of the main leaf as the supplementary leaves do not fully pick up the action until appreciable flexure of the main leaf has taken place. In the case of the single-leaf spring, there will be a continuity of action along the whole length of the spring similar to that in a bow when the archer draws back the bow string. Consequently, with the longer action, chances are that the initial spring rate could tend to be slower than with the multi-leaf spring.

REDUCED IMPACT IMPROVES RIDE

As regards unsprung weight, the importance of just a few pounds is much greater than often realized. This is particularly true if the unsprung weight is accompanied by a reduction in spring rate. The basic formula of $1/2MV^2$ has a great deal of meaning as far as spring suspensions are concerned. This formula, of course, is a measure of the energy in foot-pounds contained in a moving weight.

Both the mass (M) and the velocity (V) at which the weight is traveling are factors. Thus, if we have a reduction of two feet per second in the velocity and also cut fifteen pounds in the unsprung weight, the impact is reduced by 4 x 15, or 60 ft-lbs. in the blow delivered by the unsprung weight against the spring-supported structure. This reduction in impact contributes to an improved ride.

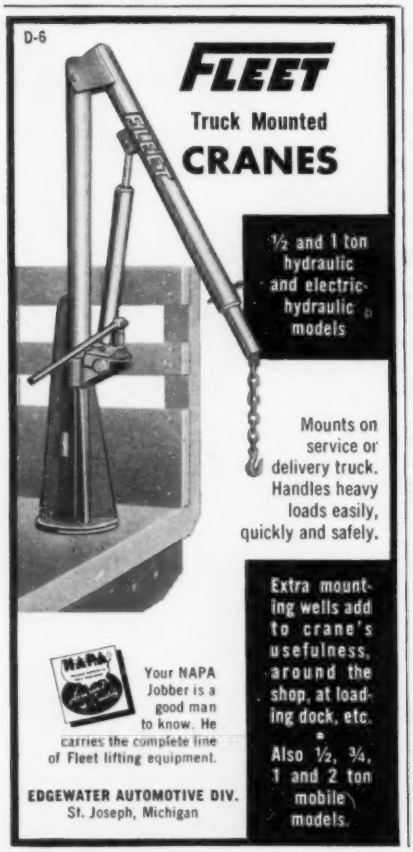
Many of these considerations can be interpreted in terms of customer satisfaction because of the easier ride which will be particularly noticeable on the type of highway surface most encountered by the car user of today. Not many travel over severe roads but even the slight surface irregularities of a modern concrete road can result in noises and minor bumping which are hardly noticed but which would contribute considerably to driver comfort if they were eliminated.

SERVICE NO PROBLEM

From the standpoint of the service man, the single-leaf spring will not introduce any problems which are not comparable to those experienced with multi-leaf springs. In the case of a broken spring, chances are the car can be towed in without difficulty as the break will occur on one side or the other of the center attachment point and the other half of the spring will hold sufficient alignment to get the car into the shop. The matter of replacement then is simply one of reaching the nearest place for replacement parts.

Actually, because of the natural high factor of safety which will be insisted upon by the car manufacturers who might install this type of suspension, breakages will probably be rare.

The entire problem of the single-leaf rear spring is one of great current interest and there is considerable debate as to whether or not, as some have predicted, it will be found on any of the 1962 models.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The cooling system—keep it clean

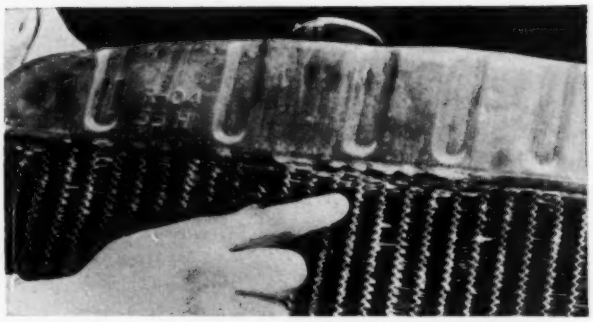
The internal combustion engine's heat balancing process controls metal temperatures within safe limits through rejection of excess heat. Only a clean, non-corrosive, free-flowing and mechanically sound system can do this.

• CLEANLINESS long has been associated with precision service work on engine, transmission and other parts, and just as important is cleanliness of the engine cooling process. It is vital in liquid-cooled engines.

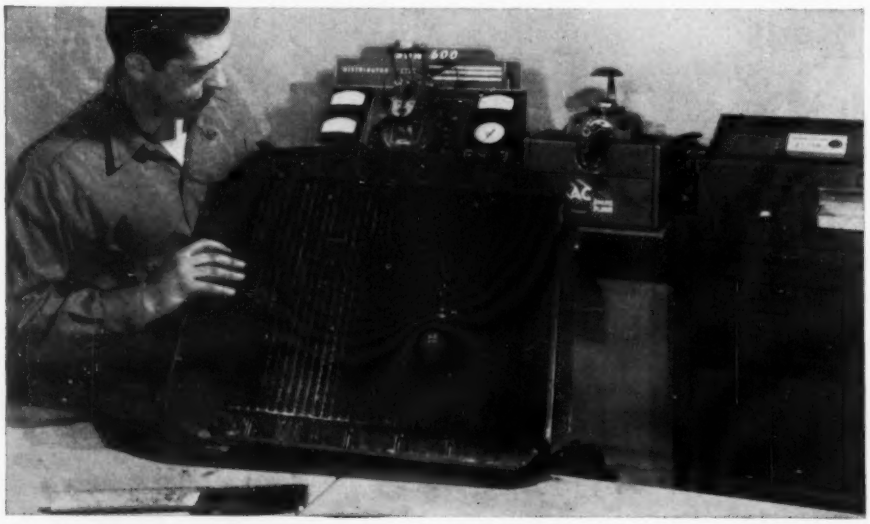
Regardless if the cooling system components which control circulation are in top mechanical condition, the cooling process cannot work if there's partial or considerable clogging of coolant flow. The coolant must be protected with an ingredient that prevents corrosion, because the latter can cause failure of parts or clogging by rust which slows circulation and heat transfer.

In parts of the U.S. where cold weather has affected car operation—particularly engines—this is the time of year for service attention to the cooling system. Much hot weather driving lies ahead and engine operating temperature control by a cooling system in good order (and clean) is a pre-requisite. The illustrations shown in this article bear this out.

This is the time of year when service stations and shops will find many of their customers in the right frame of mind to buy a thorough check-up for their cars. All that is needed to ring up profitable repair and maintenance sales is a reminder about the strain a hard winter's driving has placed on the customer's car. One of the best sales points you can make is the need for a thorough cooling system service job



One of the first places to look for radiator leakage is at the junction of the tubes and the header plate. Leakage here is usually caused by mechanical breakage of the solder seams due to vibration. Front end vibration due to wheel unbalance can contribute to this kind of damage.



The radiator shown here has been removed from the car for servicing because of a leak in the top tank. Semi-annual cooling system maintenance and inspection, including the draining and flushing of worn coolant and the installation of fresh coolant and fresh inhibitor will avoid serious failures.

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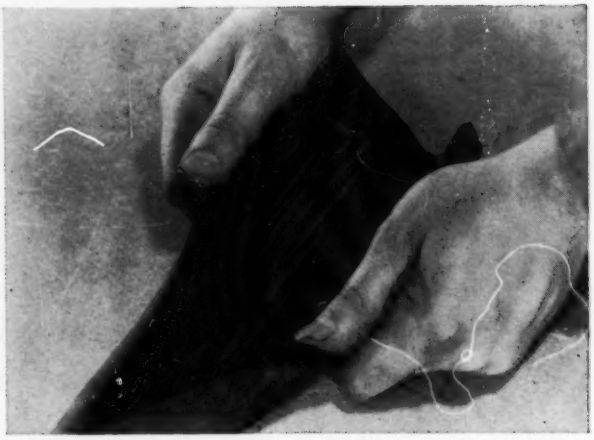
Installed, this top hose looked still serviceable. At times, hose deterioration happens almost completely internally and cannot be detected by the usual method of squeezing and twisting. A look at the inside of this hose (shown at the right) shows that this apparently sound cooling system component should indeed be replaced.



The same hose shown in illustration at left, sliced open to show the advanced deterioration taking place inside. The deterioration can slough off pieces of hose which could obstruct coolant flow through the radiator core. But more importantly, this hose is quite likely to fail under difficult operating conditions when it is needed most.

before hot weather sets in.

Remind customers that there is an element of doubt about "permanent" antifreeze. In any antifreeze solution vital rust and corrosion inhibitors break down after a certain amount of use. The trouble is, it is impossible to tell precisely when this has occurred without careful laboratory tests. No visual do-it-yourself inspection can determine the condition of the antifreeze solution.

If one of the recently introduced "never-drain" type of antifreeze, such as Telar was used, its normal color should be red. However, if the inhibitor has been exhausted by acids, the entire solution goes over to the acid side and the color changes from red to yellow. This is a signal that the coolant should be drained, discarded and checks should be made of the head gasket and other parts for possible replacement. The maker of Telar (DuPont)

This reverse acting thermostat has seized in the open position. It can no longer effectively regulate engine operating temperature. It will allow over-cooling with its accompanying increased sludge formation and poor gas mileage. Where an engine has a history of below normal temperature gauge readings, the thermostat should be removed and checked at its rated opening temperature.

Below: Water pump with the fan belt pulley attached illustrates the need for careful visual inspection of cooling system components. In operating position the leak-betraying rust would be on the bottom of the water pump. The actual point of leakage at the seal is hidden from direct view from above by the fan belt pulley. If a car has a history of much coolant leakage, careful inspection of all gaskets and connections with a mirror, if necessary, is called for.

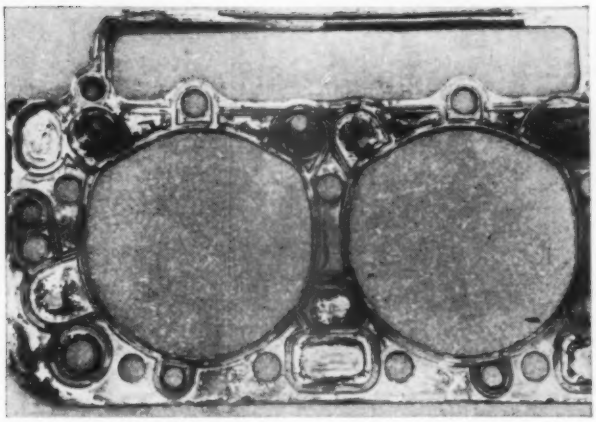
states that exhaustion of the inhibitor is rare, but can, nevertheless, happen. In that case the coolant cannot be re-inhibited with any corrosion inhibitor and a fresh solution must be used.

The only way to be sure that rust and scale formation will not clog radiator tubes and cylinder water jackets is to drain the old solution and flush the cooling system, including the heater.

A good thing about selling a cooling system job is the chance it presents for additional repair and maintenance work. These bonus profits will be yours in almost a third of the cars coming in for antifreeze drain and cooling system flush, providing you make a thorough inspection.

Here is a suggested cooling system maintenance program that will help to put your customers' cars in good operating condition for summer driving:

- Drain used antifreeze. This should be done to



This steel shim head gasket has been attacked by two separate but related leakage problems. Sections between cylinders have been subjected to exhaust gas leakage. The coolant ports have been corroded and eroded by exhaust gas and a corrosive coolant. The damaged gasket allows more leakage and even more corrosive coolant. Originally, this condition may have been caused by a distorted cylinder head or block, or wrong torqueing of the head bolts. When there is loss of coolant with no external leakage present, an exhaust gas leakage test should be made.

Cross-section of cylinder head showing water side of the water jacket. Coolant passages circulate the latter around the valve seats and spark plug bosses. These are critical cooling areas. Rust or corrosion in these areas will impede heat transfer and coolant flow enough to cause spark knock due to overheated spark plugs. Rust and scale deposits around the water side of the valve seat can obstruct heat transfer in this area, resulting in valve burning and valve seat cracking. It is in these restricted areas of the engine that poor cooling system maintenance first takes its toll.

play safe, even though the solution contains ethyleneglycol. A winter's use has probably caused rust and corrosion inhibitors to weaken or lose their effectiveness.

- Flush cooling system with fresh water or a chemical flush.
- Check thermostat for correct opening temp.
- Replace all hose that show signs of deterioration. Checking radiator hose to make sure of its flexibility serves to cut down transmission of engine vibration to the radiator.
- Tighten hose clamps.
- Test fan belt (or belts) for correct tension and for indications of wear.
- Check radiator for signs of leakage; check pressure cap and rubber gasket seal.
- Remove all foreign matter that may be hindering the flow of air through the radiator core. Blow the passages clear with an air hose.
- Refill the cooling system with clean water; the softer the better. Then add a rust inhibitor.
- Warm up the engine, then check the cooling system water height in radiator. Complete the check by inspecting the system for leaks at radiator, hose, water pump and cylinder head gaskets.
- Make sure ignition spark timing is correct. If the spark is retarded, or if the advance mechanism is not functioning correctly, engine overheating may result for which the cooling system would be blamed.

(Illustrations for this article were obtained through the courtesy of Union Carbide Chemicals Co.)

Distorted Float Bowl Vent Reed Has Detrimental Effect on Fuel Economy

When servicing or handling the new Stromberg WWC3 carburetor used on some 1961 Chrysler-made cars, care must be exercised to prevent damaging or distorting the float bowl vent leaf spring. Distortion of the reed, improper seating of the rubber valve or improper adjustment can have a definite effect on fuel economy.

In all cases where an engine tune-up is performed, or fuel economy is being investigated, the factory recommends that the valve seat on the carburetor be examined for any roughness or unevenness that would prevent proper sealing of the rubber valve on open throttle. Adjustment of this valve should be made after the pump travel setting.

With idle speed screw set at curb idle, hold throttle lever in closed position and choke wide open. Check opening of the bowl vent valve at the center of the hole with the rubber valve hanging free. If necessary, use Tool T-109-214 to bend bowl vent lever to obtain a setting of .062" to .094" clearance.

If leaf spring is found to be deformed, preventing proper closing of the rubber valve, remove the leaf spring and straighten. Then reinstall and recheck for complete seating of the rubber valve.

Use of Airliner for 2 Weeks plus $5,000 Top Prize in Champion Spark Plug Contest

From April 11 through May 31, Champion Spark Plug Co. is sponsoring a consumer contest in which car dealers, service station and independent shop personnel share equally with the winners. Top prize is the use of an executive airliner and crew for two weeks plus $5,000 tax paid spending money. There are 1159 other prizes, including cars, boats, radios, movie cameras, bicycles, camp stoves or picnic coolers.

To enter, the motorist first has his spark plugs checked. Then he selects one of five informative statements about Champion spark plugs and writes, in 25 words or less, why this statement is the most important reason for insisting on Champions. All the mechanic or attendant has to do to qualify for the same prize the motorist wins is sign the motorist's entry blank after the spark plug check is made.

HEAVY LOADS
can mean
LOADS OF SALES
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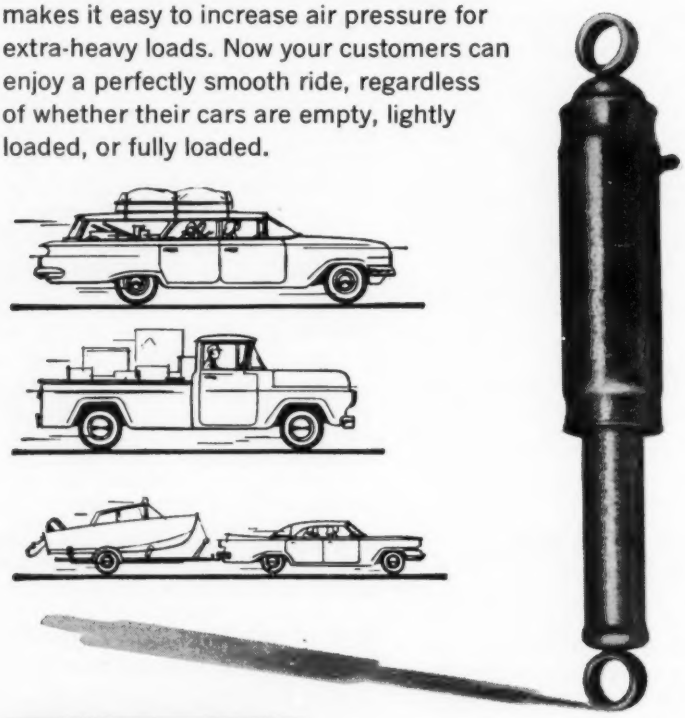
This new oil-air rear suspension is specially built for your customers with vehicles carrying heavy loads. Sell them on the extra carrying capacity which provides a level ride and prevents rear-end sag and bumper drag. Show them the external valve that makes it easy to increase air pressure for extra-heavy loads. Now your customers can enjoy a perfectly smooth ride, regardless of whether their cars are empty, lightly loaded, or fully loaded.



BRIGGS

LOAD ABSORBERS

The Briggs Shock Absorber Co.
Cleveland, Ohio

Stainless steel mufflers for the T-bird

● MODERN higher compression engines and higher octane fuels combine to knock out mufflers at the rate of 25 million a year. The annual replacement bill for the car owner, according to independent surveys, is from $290 million to $500 million a year.

Present day fuels for motor vehicles can cause, under some conditions strong acids, which are passed into the exhaust system with water vapor. Such acids quickly rust through metals which are less corrosion resistant than stainless steel.

Tests show that the short run, stop-and-start kind of driving is hardest on mufflers. In this type of driving the highly corrosive condensates (acids) have a better chance to rust out the metal.

Heat is another muffler-destroying factor. High speed turnpike driving can push the temperature in a muffler up to 1100° F. Steady 60-miles-per-hour driving will result in temperatures slightly above 850° F.

For the first time in the automotive industry a new muffler made of a new stainless steel is being installed on an American production car. More than 50 per cent of the muffler is stainless steel, with stainless being used in critical areas. The new muffler Ford is now putting in the 1961 Thunderbird will last at least three times as long as the standard muffler used on most of currently produced automobiles.

The new steel for the muffler was developed by Allegheny Ludlum Steel Corp. and is called MF-1. Allegheny Ludlum metallurgists estimate that the FM-1 steel is from five to six times more corrosion resistant than aluminized steel and from 15 to 18 times more corrosion resistant than conventional mild steel usually used in muffler manufacture.

The Thunderbird uses a dual exhaust system which calls for two mufflers using stainless steel. Each of these mufflers weighs 13-lbs. or a total of 26-lbs. per car. The stainless steel used in making each muffler is 7-lbs., a total of 14-lbs. per car.

In 1960, the Ford company turned out 87,218 Thunderbirds, it is said. Should the same number hold true for 1961, it would require a total of 610 tons of the special stainless steel for mufflers.

With the MF-1 muffler steel, the steel supplier scores an important breakthrough—the use of stainless steel for a functional part of the motor vehicle. While much stainless steel is used in the automobile industry, almost all of it is used in the body trim or decorative areas.

In 1960, a total of 6,697,252 passenger cars was built in this country. Using just 6-lbs. of stainless steel for a muffler for each car, said to be a low estimate, it would mean that the potential for stainless steel in this new use would amount to 20,091 tons. In 1960, stainless steel shipped directly to the entire automotive industry amounted to about 85,000 tons; this gives some indication of the huge potential for the corrosion resistant materials in this new use.

While the muffler steel was being developed, test mufflers, using the special MF-1 material, were being used on a number of cars throughout the country to prove the worth of the new material.

On the Thunderbird the MF-1 material is used for the inner shell, one baffle, and the heads of the muffler. These are the areas that take the brunt of corrosive wear. The inner shell and baffle are of .036 gage and the heads are of .048 gage. It is stated that MF-1 has a chrome content of about 11 per cent with titanium and other elements added to give the steel its properties. MF-1 steel, besides being corrosion resistant, is said to be unusually ductile and easy to weld.

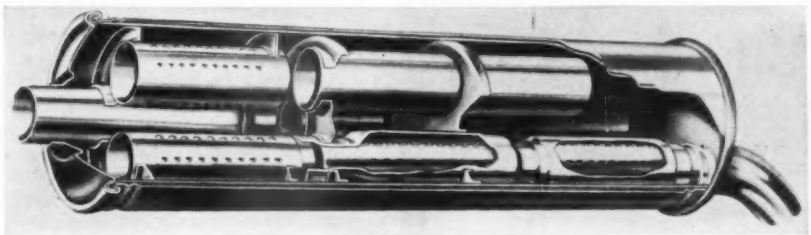
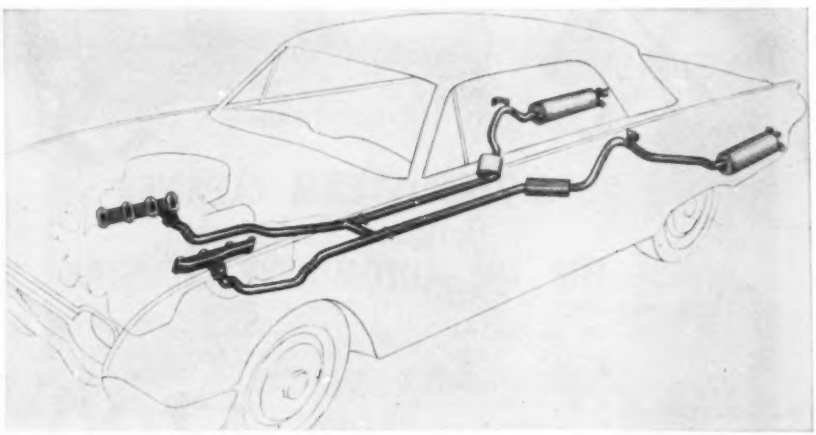


Diagram of the dual exhaust system used in the 1961 Ford T-Bird. Each muffler weighs 13 lbs. Stainless steel is used for the inner shell, one baffle and the heads of the muffler.



Cross-section of the new Thunderbird muffler made of new stainless steel known as MF-1. The steel is said to be considerably more corrosion resistant than metals heretofore used for mufflers.

Easy Way to Locate Exact Point of Valve Opening

Here's a handy tip from Champion Spark Plug Co. on how to locate the exact point at which the valves open:

Adjust the tappet clearance to .005″ more than the specified timing clearance. Then turn the crankshaft in the direction of rotation until a .005″ feeler is just gripped between the valve stem and lifter (or rocker arm).

For example, if the intake valve is supposed to open at T.D.C. with .0015″ clearance, adjust the clearance to .020″. Then, insert a .005″ feeler and turn the crankshaft until the feeler is just gripped. This would then be the same as the zero clearance position with the tappet set at .015″.

For every thousandth of an inch that you vary the tappet gap, you alter the timing of the valve relative to the piston by approximately 2°.

WHEN CHANGING YOUR ADDRESS

Please notify us 5 weeks in advance. Supply us with both your old and new address, including address label from current issue if possible. Copies we mail to your old address will not be delivered by the Post Office unless you pay them extra postage. Mail address changes to Circulation Dept., Automotive Service Digest, 900 South Wabash Ave., Chicago 5, Ill.

Clinic . . . (*Continued from page 6*)

(under panel) and this also was burned up. All three of these were replaced, and we turned on the ignition (without starting the engine) and still had the same condition. Wiring, etc., has been checked, but found OK.

We have checked with other Ford shops but so far, no soap. What do you advise, or what are we failing to do?—*V.B., Mt. Morris, Ill.*

Answer: The King-Seeley instruments used on Ford cars will register at the highest point on their respective dials when the current is turned off, which will account for the temperature gauge reading "Hot" and the fuel gauge reading "Full."

There must have been voltage much too high for these instruments to burn up. One instrument burning up might be due to stuck contact points in the sending unit, but with all of them burning up, voltage must be the trouble. Either the generator-regulator is set much too high or possibly 6-volt instruments were used instead of 12-volt instruments. The last year that Ford used six volts was in 1955. If you can get some 1955 instruments, check the voltage of these and compare them with the voltage of those installed.

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BLAST IT CLEAN WITH HIGH PRESSURE STEAM!

No Transmission Kickdown

Our problem is with a 1956 Fordomatic. The first time the car came in we overhauled the unit. Plates in the front and rear clutches were worn out, with no drive in any position. In addition to the clutch plates, both bands, front oil pump, center support bushing, all gaskets, seals and "O" rings were renewed. Transmission fluid was also changed.

The customer picked up the car in the evening and was back in the morning complaining of no kickdown. It was locked up in low, with no intermediate speed. This time the rear clutch plates stuck together (front clutch OK). Rear clutch plates were changed along with rear clutch piston return spring and necessary seals and gaskets.

Accusing the driver of abusing the Fordomatic, we made a stop to lock out low position on the gearshift and adjusted the gas pedal linkage so he couldn't get full throttle. This made the Fordomatic last longer, but the driver kept complaining, so we set the linkage back to where it should be. A few days later he was back again with the same "no kickdown" complaint.—*J.R., Sayreville, N. J.*

Answer: After carefully reading your letter and checking with several expert transmission men, the only conclusion seems to be that the trouble was either the result of excessive speed in "low" or continued high speed of the engine with the transmission in neutral. The latter will ruin a transmission in a hurry.

Clutches do not stick when they are properly lubricated unless the transmission is run at excessive speed in "low," the engine is operated too long at high speed in "neutral" or the car is towed with the rear wheels driving the transmission for more than the distance recommended by the manufacturer.

The fact that the driver complained when he could not get full throttle would seem to indicate that he was using full throttle much too frequently and "too full."

Low Mileage Complaint

We have a '57 Ford Country Sedan, with Thunderbird engine equipped with 2-barrel carburetor and have been unable to get more than 10 mpg. We have done the following:

Replaced fuel pump for testing; checked for leakage of gas; rebuilt carburetor; tested with different carburetor; adjusted valves; adjusted automatic transmission (shifts at approximately 22 mph); adjusted timing on the road (set at 11° advance now); removed manifold and replaced heat tubes; cleaned passage in automatic

choke and installed #60 jets in carburetor.

The car runs well, idles well and combustion tests OK. Car consumed 88.9 gallons in 777 miles.

What further suggestions have you? —*R. G., Madison, Wis.*

Answer: Fuel mileage is one of the most intangible items in connection with running an automobile. Without knowing the kind of driving being done, the speeds driven at, the length of trips taken and the amount of stop-and-go driving, we cannot say whether 10 mpg is good or bad. You have checked a lot of factors that could affect fuel efficiency.

What is the compression pressure? Is it uniform in all cylinders? Have you had the car on a dynamometer to see what its power output is? Have you yourself made a mileage test run of say 10 miles at a speed of 40 mph? Who gave you the figure of 10 mpg and how was it arrived at?

About the only thing we can suggest is to power time the ignition at a vacuum of 10 in., check the spark plugs for heat range and gap, check the polarity of the secondary (which should be negative at the plugs) and check the fuel level in the float chamber.

With this big engine you will not get as good mileage as with the 292 cu.in. engine. Also, this four year old engine may have a lot of miles on it, with an understandable amount of wear.

Tracking Engine Noise

I noticed in the Diagnosis and Tune-up Manual a description of an electronic sound probe. This should be an interesting device and I would like to know more about it, or similar equipment.

I am a mechanic for a sugar plantation in Hawaii and would like to use a probe on our cars and trucks.—*H. T., Kukuihaele, T. H.*

Answer: The electrical soundscope shown in the book was written up about eight years ago and we doubt if this equipment is even made today. We do not recall the name and address of the manufacturer.

However, we have found that the stethoscope type of instrument used to analyze and track down sounds around the engine or other mechanical equipment is just as good, and is available from several companies. It is a very useful instrument for checking noises around the engine. For example, you can pick out noisy valves and rocker arms, defective generator bearings, noisy engine bearings, etc.

LOOKING FOR A JOB? USE OUR CLASSIFIED COLUMNS—PAGE 80

Renault Warns Against Use of Air Conditioners

Renault has issued a firm warning against the field installation of air conditioning units in its cars. While the factory is attempting to assist potential suppliers in the production of such a unit, it has found none currently on the market that they believe satisfactory.

The factory claims that the horsepower requirements for "even a moderately effective air conditioner are too high, and vehicle performance suffers." Also, the factory states that the extra power demand of the air conditioner makes the car liable to overheating in heavy traffic.

The warning was issued as a result of some cases last summer in which air conditioners were fitted to Renaults. The factory warranty will be voided on those parts that could be adversely affected by the installation of an air conditioner.

To make your shop more profitable . . . your time more valuable . . . be sure to read this month's "These are New" section

Revolutionary new

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A really *new* product you can shout about! Golden Glide Load-Absorbers combine an oversize shock absorber with an air spring in one unit. They improve a car's load-carrying capacity at no sacrifice in riding comfort. Load-Absorbers *always* deliver the ideal ride—loaded heavy or light. They provide gentle, soft cushioning, plus added stability. No wheel "chatter" on bumpy roads. Just a velvet-smooth ride under all road conditions. Contact your jobber today for full details.

THE GOLDEN GLIDE SHOCK ABSORBER COMPANY
Cleveland 15, Ohio

GOLDEN GLIDE Load-Absorber

Servicing the Tempest "rope" drive shaft

By E. S. HARRIS

• THE TEMPEST'S flexible "rope" drive shaft receives considerable loving care during the many steps in its manufacture, but its servicing is more or less orthodox for the mechanic except for the extreme care that is necessary to avoid damaging the plastic anti-rust coating.

The drive shaft comes in two diameters, .650″ and .750.″ The .650″ diameter shaft is used on the automatic drive equipped vehicles, its flange being bolted direct to the flywheel. The .750″ diameter shaft is used on the standard synchro-mesh transmission and its flange is bolted to the clutch drive shaft. The rear of the shafts are splined to the transmission.

The shaft passes through a curved torque tube which joins the engine and transmission and contains two sealed damper ball bearings, centrally located in the tube, which support the shaft. The ball bearings are sealed for life, are press fitted over plastic lined steel sleeves, and are encased in rubber insulated, stamped retainers which are bolted inside the tube. The rear of the shaft turns in ball bearings located in the transmission extension housing.

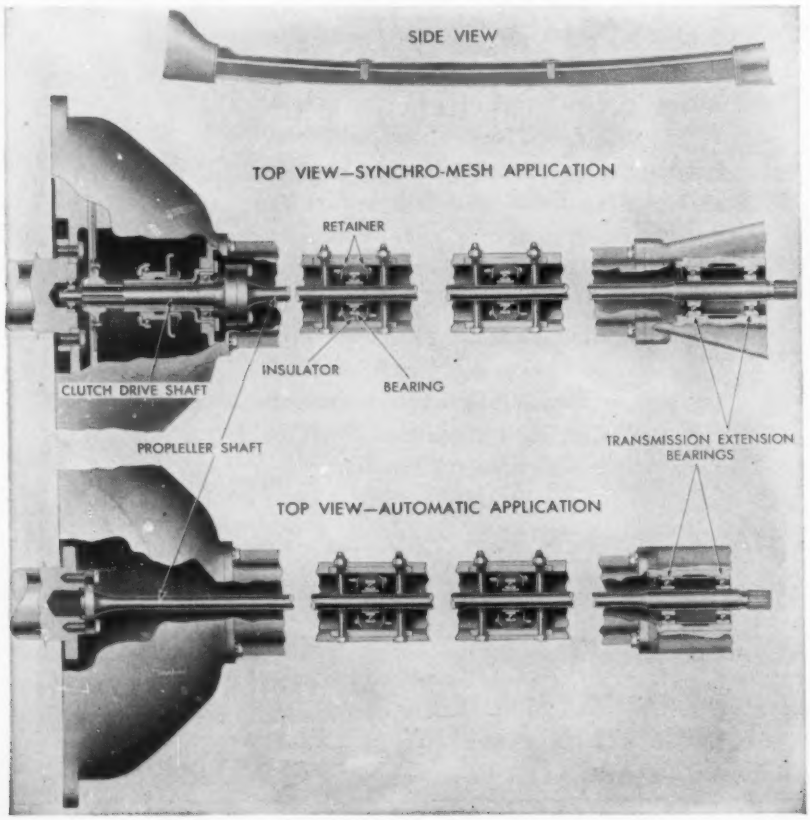
REMOVAL AND DISASSEMBLY

Removal and replacement of the drive line from either the synchro-mesh or automatic drive is by similar procedures. The following steps outline the operation on the synchro-mesh type:

1. Remove propeller shaft damper bearing retainer bolts.
2. Remove parking brake cable from torque tube.
3. Remove exhaust crossover pipe (V-8's only).
4. Disconnect transmission control rod from transmission.
5. Remove 3 bolts from gearshift lever housing and remove gearshift housing and control rod.
6. Remove flywheel housing bottom cover.
7. Support rear of engine with stand.
8. Remove 8 screws from torque tube access hole cover and remove cover.
9. Remove 6 bolts from propeller shaft flange.
10. Place wiping rag between propeller shaft and torque tube.
11. Partially back off 6 bolts connecting torque tube to flywheel housing.
12. Support torque tube so it will not fall, and remove the 6 bolts.
13. Pry torque tube and propeller shaft assembly away and down from flywheel housing.
14. Place wood block (approximately 3″ square) between transmission extension and floor of car to position transmission for reassembly. Support torque tube with a stand.
15. Remove 6 bolts connecting torque tube to transmission. **Caution:** Propeller shaft and torque tube are held in place only by transmission extension bearings and must be supported to prevent bearing or bar damage.
16. Remove propeller shaft and torque tube as a unit by pulling on propeller shaft flange. **Caution:** Pull propeller shaft straight out of transmission so that shaft will not bind in transmission or extension.
17. Place torque tube and propeller shaft on bench and pull shaft out of torque tube. **Caution:** When removing propeller shaft from torque tube it should be moved without using force. If binding is noted, use drift through bearing bolt holes to spread torque tube away from bearing retainer. In all operations use extreme care not to damage coating on the propeller shaft. Damage to this coating will shorten the life of the shaft.

The bearing insulator and insulator retainer is removed from the propeller shaft by removing the two screws from the bearing insulator retainer and then removing the rubber insulator from each bearing. **Note:** Don't attempt to remove the bearings from the propeller shaft since the bearings and shaft are serviced as an assembly.

Synchro-mesh and automatic transmission propeller shaft application.



REASSEMBLY AND INSTALLATION

Install bearing insulator and insulator retainer on propeller shaft as follows:

1. Place rubber insulator on each bearing, starting with bearing toward flange. **Caution:** Use extreme care not to scratch or nick propeller shaft coating.

Spreading torque tube to free bearing retainer.

2. Place insulator retainers in position and secure with two self-tapping screws.
3. Assemble propeller shaft in torque tube and place a wiping rag between front and propeller shaft and torque tube to protect shaft coating. **Caution:** Propeller shaft should enter housing without use of force. If difficulty is encountered, use a flat drift through bearing bolt holes to spread torque tube away from bearing retainer. Use care so drift doesn't damage shaft coating.

Install propeller shaft and housing assembly in car as follows:

1. Guide propeller shaft into transmission. Use care engaging splines of shaft into transmission and journal diameter into extension bearings to avoid damage to journal surface.
2. Make visual check of shaft alignment into transmission, and if full entry not completed, and only if absolutely necessary, tap front flange lightly with soft rubber hammer. Be sure splines are completely engaged in transmission.
3. Install 6 bolts attaching torque tube to transmission extension and torque to 30-45 lb.ft.
4. Remove wood block from between transmission and floor.
5. Insert propeller shaft in place on clutch drive shaft and secure with 6 bolts. Tighten bolts finger tight.
6. Remove rag from inside torque tube.
7. Secure torque tube to flywheel housing with 6 bolts. Tighten finger tight.
8. Tighten bolts securing propeller shaft flange to clutch drive shaft and torque tube to flywheel housing to 30-45 lb.ft.
9. Install flywheel cover.
10. Install 8 screws in torque tube access cover and tighten to 40-80 lb.in.
11. Install and adjust gearshift housing and transmission control rod.
12. Idle engine approximately one minute to position bearings.
13. Install and torque damper bearing retainer bolts to 8-12 lb.ft.

Removing propeller shaft flange bolts.

Rerouting of Heater Hose Cures No-Heat Complaints

A popping or "riveting" noise emanating from the heater on 1961 Mercurys when the temperature control lever is "on," may be due to improper connection of the heater hoses. Improper connection of the hoses can also result in little or no heat and possible damage to the Ranco valve and/or heater core.

The hot water (heater inlet) hose should be connected to the lower inboard heater tube at the cowl. The heater return hose should be connected to the upper outer heater tube at the cowl.

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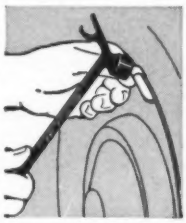
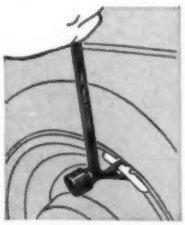
Use Our Classified Columns . . . Page 80

3 ALL-NEW TIMESAVERS FROM K-D

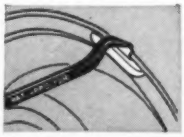
One Wheel Weight Tool— K-D No. 470— installs and removes all types



Hammers weight into place and crimps it

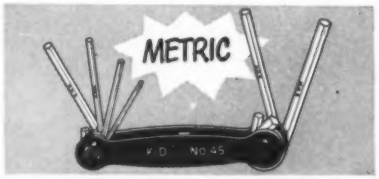


Hooks into hole, pries weight off



Special pointed end for removal of weights without holes

$3.15, Eastern resale—slightly higher in West



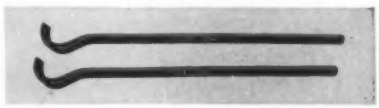
$1.15, Eastern resale—slightly higher in West

K-D No. 45 Metric Hex Key Pak— with all 6 popular small sizes

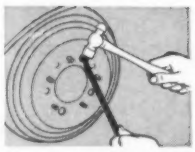
A basic pocket tool (3⅞" folded) for servicing foreign makes. Mounted in sturdy steel handle. Sizes: 2mm, 2½mm, 3mm, 4mm, 5mm, 6mm. Other sizes also available.

K-D No. 284 Rear Brake Drum Puller— frees frozen Chevrolet drums on all models from 1940 on

No heat, no distortion

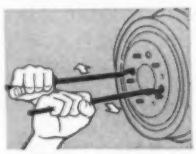


$2.75, Eastern resale —slightly higher in West



Two pullers, two easy steps

1. On opposite sides of the axle, drive wedge-shaped ends of pullers between drum and axle flange in direction of axle.



2. Pry drum loose with outward alternate rocking. Use both pullers to prevent binding.

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Lancaster, Pa.

By J. EDWARD SCHIPPER
Detroit Editor

Coming—the corrosion-free car body

Solution of the problem being approached from several directions, all of which show promising results. Definite indications that the industry is moving towards eventually having a practically corrosion-proof car.

• WITHOUT TOO MUCH fanfare, one of the most important improvements being made in automobiles is the elimination of corrosion. As one experienced body engineer said recently, "Rust and corrosion are the malignancies of automobiles. They gnaw away at the area on cars which Sir Winston Churchill probably would call the 'soft under-belly'." Without specific public attention, the development

Anti-corrosion treatment given, for example, to the 1961 Plymouth cars is such that the life expectancy of the body sill is from five to seven times longer than those of the 1956 models.

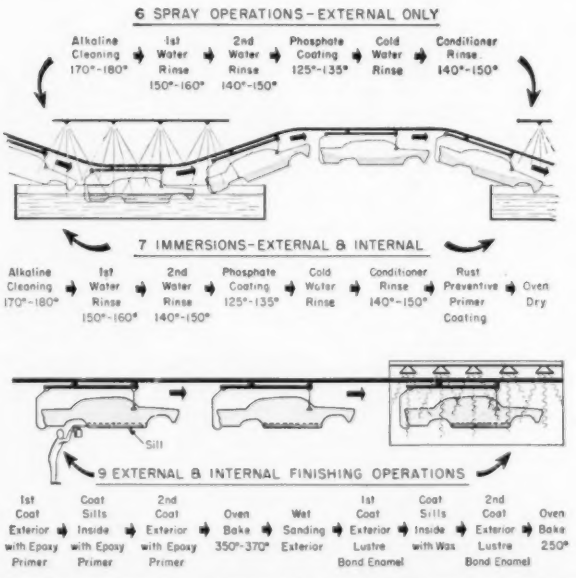
of anti-corrosion processes has been undergoing intensive study for several years. As a result there have been some remarkable advancements in the prevention of rust and corrosion during the past three years.

One manufacturer claims that the life expectancy of the important body side-sills of the 1961 model is five to seven times longer than those of the 1956 comparable unit. He adds that the useful life of other under-body structural members is in a range of 1½ to 3½ times longer than of the comparable members in a car made 5 years ago. In other words, while the problem of corrosion has not been completely solved, it has been arrested. Furthermore, there are definite indications that the industry is well on its way to eventually having practically corrosion-free cars.

SEVERAL APPROACHES

The problem is being approached from several directions, all of which are giving promising results. As would be natural, concerns which are in the materials end of the business, such as the steel companies, are trying to evolve suitable steels that have greatly improved corrosion resistance. Manufacturers of welding equipment have also made advances not only in the type of equipment but in the selection of the proper materials and the proper type of welding for each. In addition to these approaches, there is a matter of anti-rust coatings involving the use of new plastics and other compounds which are proving to be effective to a great extent.

Car manufacturers are using all three of these approaches. In addition to this, and particularly in connection with the growing trend, at least in the smaller cars, toward unified bodies, multiple dipping processes are proving to be extremely effective. While corrosion has been particularly troublesome in areas such as cities which follow the practice of dumping salt on icy streets during the winter, very few if any, parts of the country are free from the difficulty. Various means have been used for many


6 SPRAY OPERATIONS - EXTERNAL ONLY
Alkaline Cleaning 170°-180°
1st Water Rinse 150°-160°
2nd Water Rinse 140°-150°
Phosphate Coating 125°-135°
Cold Water Rinse
Conditioner Rinse 140°-150°
7 IMMERSIONS - EXTERNAL & INTERNAL
Alkaline Cleaning 170°-180°
1st Water Rinse 150°-160°
2nd Water Rinse 140°-150°
Phosphate Coating 125°-135°
Cold Water Rinse
Conditioner Rinse 140°-150°
Rust Preventive Primer Coating
Oven Dry
Sill
9 EXTERNAL & INTERNAL FINISHING OPERATIONS
1st Coat Exterior with Epoxy Primer
Coat Sills Inside with Epoxy Primer
2nd Coat Exterior with Epoxy Primer
Oven Bake 350°-370°
Wet Sanding Exterior
1st Coat Exterior Lustre Bond Enamel
Coat Sills Inside with Wax
2nd Coat Exterior Lustre Bond Enamel
Oven Bake 250°

Advance preparation of the metal, six external spray operations, seven immersions and nine external and internal finishing operations are included in Chrysler's anti-corrosion system.

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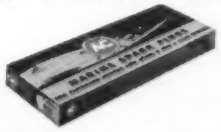

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years by the manufacturers to combat this situation but up until recently very little success has been achieved. It can now be truthfully said, however, that the industry is beginning "to get somewhere."

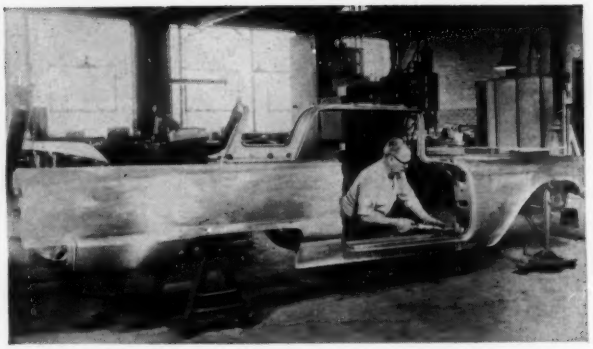
SUSCEPTIBLE TO CORROSION

Starting with steel, the fundamental material which is used in automobile bodies, the following statement was made in a recent paper given before the Society of Automotive Engineers during January, 1961, by engineers of U. S. Steel Corp.:

"Since the early days of the automobile era, the automobile body has been especially susceptible to corrosion damage. This has been a natural consequence of two factors: (1) the relatively large ratio of exposed body area to the thickness selected for the body structure and (2) the difficulty in adequately supplying protective coatings capable of isolating these complex fabricated structures from the corrosive environment.

"Unfortunately, this problem of corrosion in automotive bodies has not lessened during the half-century in which automobiles have been produced. Rather, the problem has grown more serious. Several factors recently have combined to make the problem a critical one. Foremost among these is the increased use of salts for controlling snow and ice on city streets and major highways throughout much of the United States."

These engineers point out that another big factor is the growing trend toward the use of even more complex structures in unit body frame construction involving under-body strength members with relatively thin sections. These structures are capable of resisting the complex forces to which the modern

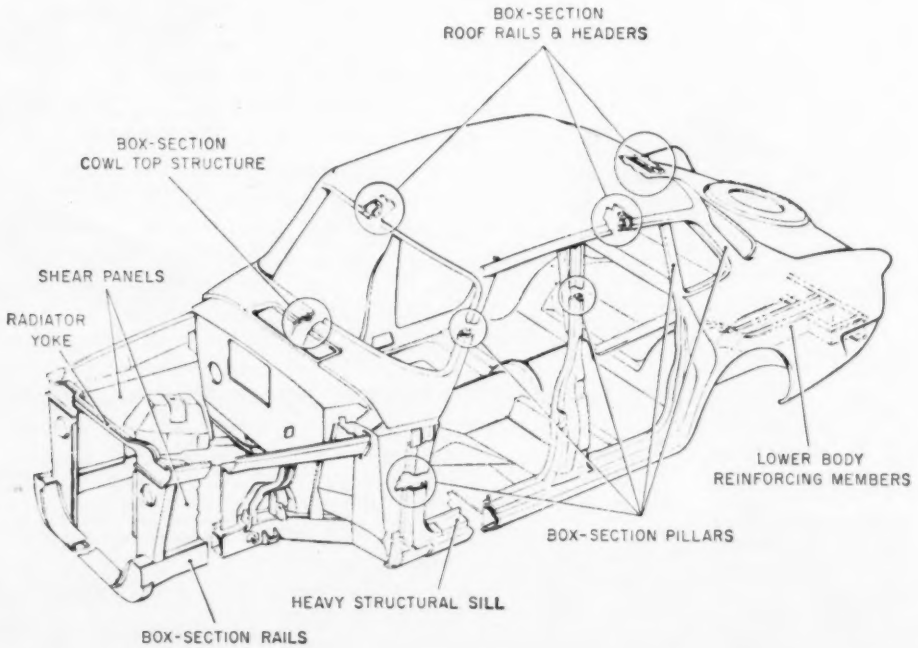


A special all-stainless steel body such as the one shown and made by The Budd Co., is expected to last indefinitely. However, stainless steel is far too expensive for mass-produced cars.

automobile is subjected. However, their very complexity—involving many box sections and other restricted configurations — makes adequate painting very difficult, traps corrosive contaminants and impedes the ventilation needed for rapid drying.

In their paper covering the subject, the engineers point out that there are three approaches to the problem: First, the simplest but more costly method is the selection of an alloy that will react with environment to form surface compounds which can serve as a protective barrier. The second method requires the use of protective coatings including hot-dip processing with zinc or aluminum. The third method involves electro-plated coatings of nickle, copper, chromium or cadmium; sprayed coatings of zinc or aluminum applied by metallizing techniques and organic coatings applied by the dipping, brushing or spraying of such compositions as alkyds, vinyls, epoxies, phenolics and acrylic systems.

Steels which inherently provide anti-corrosion char-



Typical unit body construction of Chrysler's Valliant. The body is designed to take anti-corrosion treatment most effectively.

acteristics include the copper steels, certain high-strength low-alloy steels, certain alloy steels and high-nickel steels such as stainless. Some of these steels, such as stainless, would be far too expensive for mass-produced automobiles. So, the problem comes back to the most effective method for protecting the carbon steel used in automobile construction. It is in this field that the big improvements have been made, plus a tendency to use heavier gage steels in the critical areas.

At this point it must be mentioned that an important factor, regardless of the methods used for rust prevention, is that the design of the body must be such that the problem of corrosion is always kept in mind. In other words, in the design of the body the development of pockets, shelves or recesses where salt, dirt and moisture can be trapped, must be avoided. Good drainage is particularly important.

It must be remembered, also, that increasing the thickness of a structural member to make the part last longer in spite of corrosion is practically admitting defeat. Not only does this method make the car heavier and more expensive, but also it is at best only a poor compromise because the evil day is merely being delayed.

AUTO INDUSTRY NOT ALONE

The automobile industry is not the only one that is haunted by the evils of corrosion. In fact, there are many engineers and chemists who make a life study of the subject of corrosion and have specialized in it to the extent of where they are known as corrosion engineers. The services of these men, who have done an admirable job in the marine field and in waterfront facilities, have been called on extensively for help and advice in the automotive field. To this may be credited many of the improvements which have taken place at an accelerated pace during the last 5 years. This has been a rather quiet development with little fanfare, except an occasional announcement such as when Ford at the beginning of the 1961 season announced the extensive use of galvanized steels for vulnerable points. Tests have shown that these are going to be a material factor in prolonging the life of these parts.

Materials such as SAE 1010 low-carbon steel sheet, normally used for automobile bodies, which have a protective coating as applied by galvanizing, are highly resistant to corrosion as long as the zinc coating is unbroken. However, there are certain welding difficulties present with galvanized steel such as the zinc coating adhering to the welding electrode. Development is under way at present for suitable electrode materials and welding schedules which are designed particularly for galvanized steel.

Because of its flexibility, arc-welding is growing in popularity, particularly in the unit body construction. While it was at one time used only in thicker

(*Continued on following page*)

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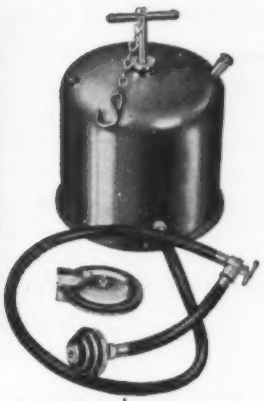

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Corrosion-free Car Body . . . CONTINUED

materials, it is now being developed for the thickness of steel used for body construction. Although not as fast as spot-welding, processes have now been evolved that have eliminated the difficulty of burning and also have increased the welding speed where it is comparable, if not equal to spot-welding. Actually the body joints have to be designed for arc-welding to make its use feasible. For example, the joints must be accessible and parts to be welded together must be clamped in the fixture.

ADHESIVE BONDING UNDER STUDY

This article reviews only a few of the many considerations which meet the corrosion engineer in his program for improvement of corrosion-free bodies. One field has not been mentioned and yet which offers great promise. That is the field of adhesive bonding. Some of the new resins and other adhesives are now undergoing considerable test and research. Engineers are, of course, wary of any cemented or glued joints and there are many difficulties in the application of the bonding material. Nevertheless, many predict that this could well be the eventual answer.

One of the most interesting bodies from the standpoint of protection against corrosion is the new Plymouth body, a unified type starting in 1960. According to Chrysler engineers the anti-corrosion treatment given to every 1961 Plymouth and Valiant car is so effective that the life expectancy of body sills on the current cars is from five to seven times longer than those of the 1956 Plymouth and the useful life of other under-body structural members is in the range of one and one-half to three and one-half times longer than that of the comparable members of the 1956 Plymouth.

Some of the reasons behind this improvement lie in the fact that the body is actually designed to take the anti-corrosion treatment most effectively. A typical example is the outer side sill of the 1961 Plymouth unibody which illustrates the anti-corrosion precautions now taken on a unit construction car. The outer side sill is a key structural member of the car body and, because of its exposed location—right between the front and rear wheels for the full splash effect from chemically treated winter streets—it traditionally has been one of the first areas to show corrosion.

IMMERSION SEALS ALL AREAS

In the first place, the present day side sills are twice as thick as on the 1956 model. This particular member is given a 7-dip anti-rust process along the production line. Each of these dips applies a coating adapted for its particular effectiveness. For example, one of them is one of the epoxy resins known for its high adhesiveness, toughness and durability. With the unit type body, the car passes through immersing pools of coating material which permit the fluid protective coatings to flow into recesses which would not be accessible in any other way. This seals off pockets which are always vulnerable spots.

Another factor in eliminating starting points of corrosion on this type of car is that the body structure is about three times as rigid, thus eliminating much of the "working" of joints that create starting points for corrosion to make its first inroads.

Looking ahead a bit it is quite certain that more will be heard along the line of adhesive bonding. Engineers are practically unanimous in the opinion that the right adhesive used in bonding parts designed for the use of this type of bonding will be satisfactory. Some of the requirements are to provide a contact area sufficient to develop the required strength. With this type of lap there need be no worry about a crevise permitting the admission of moisture since the adhesive itself will block out any leakage.

BONDING ADHESIVES BEING IMPROVED

Just as in welding, bonded joints should be loaded in shear rather than in tension. Of course, there are certain precautions which must be taken in this form of joint. First, the surfaces to be glued or bonded must be clean and dry. The parts must be brought into close contact and after the adhesive has been applied, given ample time to cure and develop its full strength. In a recent paper before the SAE given by Herbert D. Van Sciver of the Budd Company, he stated that while there is only one remedy for dirt, namely cleanliness, adhesives are being developed that will be compatible with oil films. This would allow sub-assembly bonding without the necessity of repeated cleaning and re-oiling operations.

With the approach to the rust-proof body being made from these several directions, it is apparent that the industry now has all of the ingredients to produce such a unit. In fact, much of the work has already been done. It will have to be remembered that the end result of completely eliminating the dangers of corrosion must come from a combined effort of the designer and stylist, as well as the engineers who must keep in mind requirements for the processes used in rust prevention in the concept of every structural part.

Alternator Service Tips

Most mechanics know that the alternator has replaced the generator on most Chrysler-built cars, but here are three procedures not generally known regarding this new type charging circuit:

1. Since the alternator charges at very low engine speeds—when adjusting engine idle, turn the headlights on. This will insure against too low an idle setting.
2. When charging the battery of alternator equipped cars, disconnect the cables *before* charging. Wrong hookup (polarity) can damage the silicon rectifiers.
3. Always install the battery with the negative post grounded. Wrong polarity can damage the rectifiers or burn the wiring harness.

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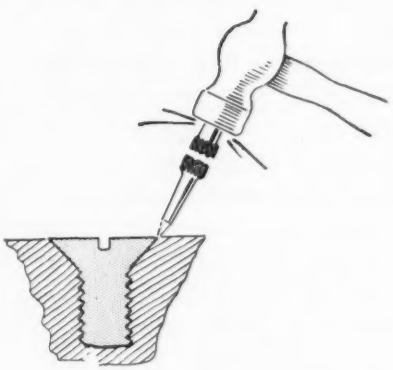
• ONE OF THE MORE interesting developments of recent years is a "liquid lock nut," rather far reaching in its application to the automotive service and industrial fields.

This product, bearing the trade name Loctite, locks like a lock washer, retains like a shim and seals like a joint compound to predetermined torque values. Consequently, the maker points out that removal of parts so treated presents no problem to the shop mechanic.

Automotive grade Loctite is a thin liquid sealant that hardens into a tough plastic bond when confined between closely fitting metal parts. This self-hardening property makes it unique among sealants and adhesives and is based on two factors. First, contact with air keeps the sealant liquid; secondly, contact with metal surfaces hastens hardening.

In joints between mating metal parts, the sealant hardens rapidly because it is in close contact with metal and out of contact with air. The maker states that a film of the sealant on an exposed metal surface stays liquid as long as it is in contact with air.

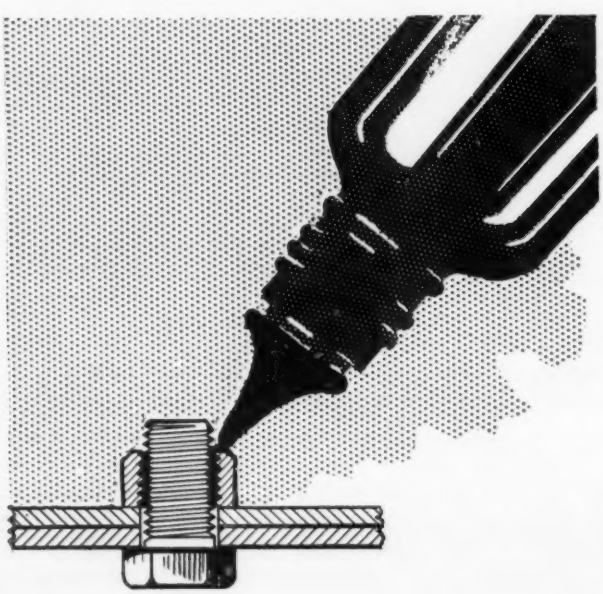


The method of securing machine screws by the well-known and rather crude process of "staking" with a prick punch is eliminated by use of the sealant.

It can be readily understood that the potential uses of the sealant in the automotive service field are many and varied. For example, all types of threaded fastenings can be treated, tightened to the desired predetermined torque value and literally forgotten. The maker of the product emphasizes that parts which are a constant source of nagging worry, such as connecting rod nuts and other fasteners buried in the heart of the engine, are made "fail-safe" with use of this sealant.

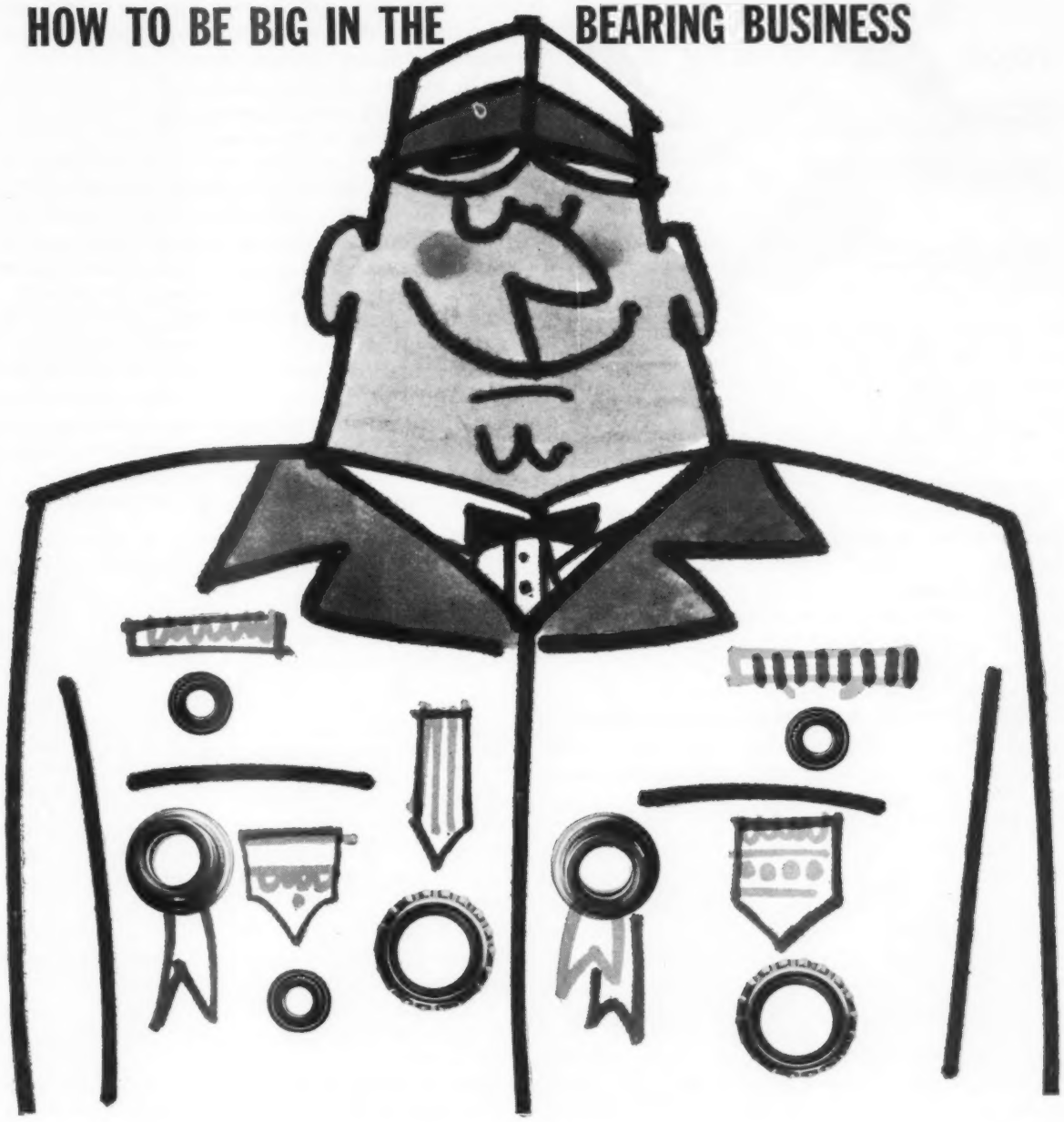
The point also is made that cylinder head nuts, manifold nuts and the many other bolts and screws

By BEN IKERT
Editor



Application of the sealant is done by touching the joint with the applicator nozzle on the bottle. The sealant is drawn into the joint by capillary action and automatically hardens, as it is in close contact with metal and out of contact with air.

HOW TO BE BIG IN THE BEARING BUSINESS



New Departure and Hyatt make it easy and profitable for you to be the wheel bearing expert in your neighborhood. Here's all you do! Remind customers that for safe driving, front wheel bearings should be serviced every 10,000 miles; keep an assortment of New Departure Ball Bearings and Hyatt Tapered Roller Bearings on hand so you will have the bearings you need for replacements on any car . . . millions of cars are factory-equipped with them.

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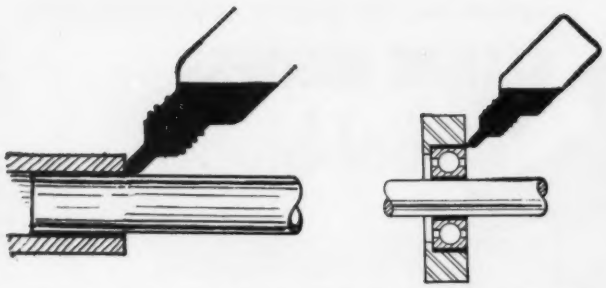


Sealant is an easy method of "soldering" sleeve joints in tubing. Right: Securing loose outer and inner bearing races to shaft and housing.

on a car may be permanently ignored once treated with Loctite. Redeeming is the fact, as previously mentioned, that the measured torque required to loosen the fastenings never changes. Consequently the mechanic has no problem as with a "frozen" nut or bolt, should later removal of the sealed fastenings be necessary.

All common metals, glass, ceramics and phenolic plastics can be bonded to themselves and to each other by the sealant. Phenolic plastic parts and some plated metal parts require a prime rinse in degreasing solvent containing a hardening agent, called Locquic activator. The locking action of the sealant extends over the whole engaged surface, resulting in a high breakloose torque.

Even after the bond has been ruptured, the hardened plastic acts as a mechanical obstruction in the threads and develops a prevailing torque type locking action which persists for several full turns. Once an application is made, such factors as vibration, noise and breakdown due to loose fastening, can be forgotten. Actually, the sealant becomes an added safety feature, plus a saving in time for the mechanic.

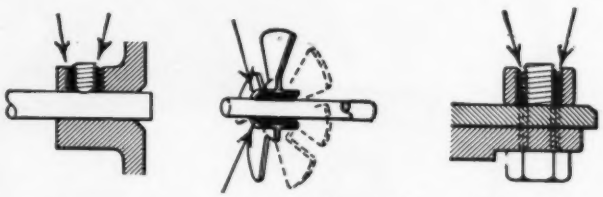
It is said that automotive Loctite is effective at temperatures from as low as −65° to over +400° F. Humidity, salt spray and fungus have no effect on the breakloose torque of screws so treated. It also is impervious to engine oil, gasoline or brake fluid. Even acids are said to have little or no effect upon holding power and solvents do not dissolve the hardened sealant.

The sealant permits use of studs with easy driving "nut and bolt" type fit whereby studs can be driven with the fingers. Brushing, dipping or nozzle applications are satisfactory.

In the case of studs bottomed in blind holes, a few drops of sealant are placed in the hole. On assembling the stud, sealant is forced up into the engaging threads as the stud seats, providing complete impregnation. Enough sealant has been used to fill the threads completely when a small excess is forced out at the top of the hole as the stud seats.

On screws which position precisely the parts in a mechanism the sealant can be used to good advantage. These are, for example, screws controlling zero point of instruments, screws adjusting idle speed and mixture on carburetors, screws adjusting axial play in the armature of an instrument or in a small electric motor. Loctite sealant eliminates "searching" for the right adjustment since the locking device does not disturb the adjustment.

Other specific uses of the sealant are on electrical



Securing set screw (left), fan hub on shaft (center) and brake backing plate bolt nut (right) with a liquid lock.

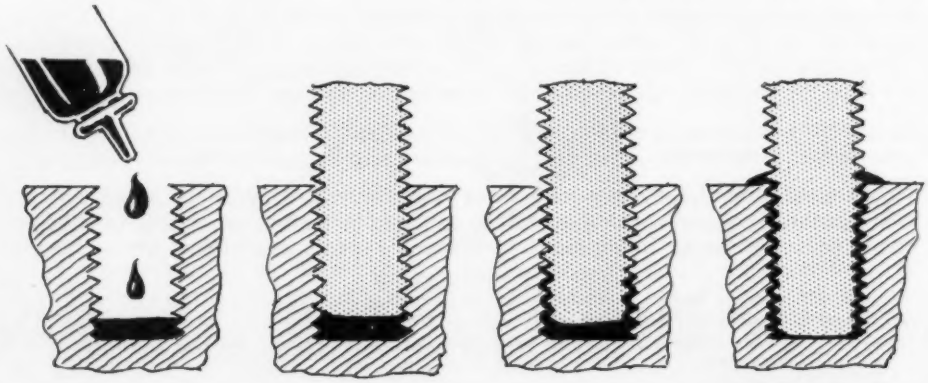
equipment—nuts adjusting contacts in relays, the axial play in instrument motors, spacing of interleaving plates in a variable condenser. Rubber insulated cushioned mountings, spring mounted connections.

Nuts adjusting the position of shift lever in relation to ignition on automatic transmissions. Nuts on links in power steering and throttle.

On multiple bolt assemblies where it is desired to apply uniform and accurate tightening stress to each bolt.

On applications where it is necessary to protect the engaging threads against corrosion.

Nuts used on bolts passing through oil-filled



Application of the sealant to studs in blind holes. On assembling the stud, the sealant is forced progressively up into engaging threads as the stud seats.

housings where threads must be sealed against leakage as in transmissions, pump and compressor housings.

Wherever lock washers fail to provide adequate security.

On screws holding sheet metal parts to thicker parts when the engaged length is at least one-third the diameter.

On many of the screws used in the automotive and electrical equipment industries.

Hinge screws on the doors of automobiles, panel trucks, metal cabinets.

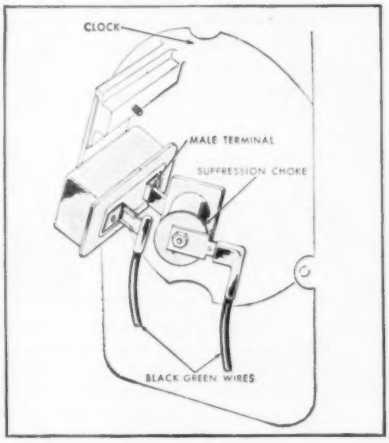
Screws holding covers on oil filled housings for power steering units, axles, differentials and transmissions.

Screws on carburetors, fuel pumps and other automotive components subject to vibration.

Innumerable other applications of the "liquid lock-nut" or sealant are possible on automotive vehicles, particularly on suspension parts, brakes, engine, transmission and drive line units.

Inaccurate Fuel Gauge on '61 Lincoln-Continental

Should you encounter an inaccurate or slightly lower than normal gas gauge reading on 1961 Lincoln-Continentals, the factory recommends checking the constant voltage (C.V.) regulator connections as follows:



Remove clock pod retaining screw and pull clock and pod assembly out just far enough to observe the C.V. regulator attached to the clock body.

Check to be sure that the radio suppression choke is attached to the male connector of the C.V. regulator (nearest the clock) and not to the female terminal.

If the choke is not properly connected, disconnect the two black-green wires and the choke.

Re-install the choke to the male terminal of the C.V. regulator and then re-connect both wires to their proper terminals, as shown in illustration.

Balancing Rear Wheels

When balancing rear wheels, Buick cautions against exceeding a speedometer speed of 35 mph on a car with a standard rear axle assembly or 75 mph on a car with Positive Traction rear axle. Excessive speeds do not improve the balancing operation and may cause damage to the rear axle assembly.

When balancing the rear wheels on a car equipped with a Positive Traction axle, jack up both rear wheels by placing the jack under the differential housing. Balance one wheel with opposite wheel removed. Install the other wheel and balance it. Do not remove the previously balanced wheel as it is now in balance and will not affect the balancing operation.

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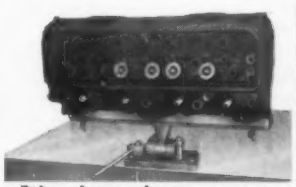
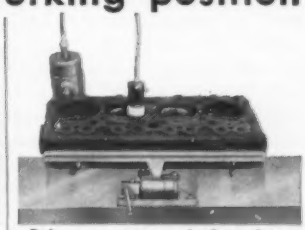
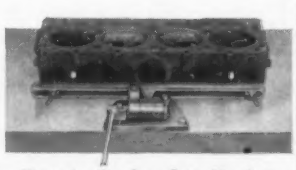
Lock the head in any comfortable working position



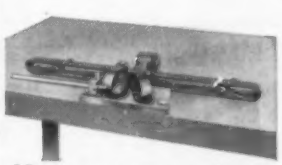
It's a lot easier to remove valves and springs when the head is locked in just the right position with a new WI-TO-CO Head Holder!



It's easy to grind valve seats with the WI-TO-CO "Feather Touch" valve seat grinder and the head locked securely in a WI-TO-CO Head Holder.



Rotate the head to lie flat on the bench for driving out or installing valve guides and seats. Cam face is hardened for maximum wear.



No cap screws, nuts, or wrenches are required to use this fixture. More efficient work is more profitable work. It's only $31.95 List!

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Pressures and their measurements

In engine tune-up work, particularly, it is well to know the difference between inches of mercury and inches of vacuum . . . also, between gauge pressure and absolute pressure.

• ONE OF OUR READERS recently brought up the question of converting pressures given in inches of mercury to inches or feet of water. This suggests that a brief discussion of pressures and their measurement may be of help in understanding values of the units used, and their relationship.

In the first place, consider that there are two bases for the starting point in measuring pressures. These are (1) up or down from standard atmospheric pressure, and (2) up from perfect vacuum or absolute zero of pressure, below which it is impossible to go. Standard atmospheric pressure is assumed to be the average barometric pressure at sea level, which is 29.92 in. of mercury. The chemical symbol for mercury is Hg and we will use this abbreviation of the symbol in this article.

The standard atmospheric pressure of 29.92 in. Hg is taken as zero (0) pressure in automotive service operations. Pressures above atmospheric are referred to as "gauge pressures" and are positive pressures. Pressures below atmospheric refer to "vacuums" or when the pressure is referred to zero of pressure, as "absolute pressures." For example, a pressure of 10 pounds per square inch above a perfect vacuum would be called "10 psi abs." The difference between absolute pressures and gauge pressures is 14.7 psi.

Pressures can be measured up only above zero absolute pressure, but may be measured either up or down from atmospheric pressure or zero gauge pressure. Depressed pressures or negative pressures, below atmospheric, are referred to as vacuums and are given in inches of mercury vacuum. When a pressure is given in inches of mercury it is assumed to mean vacuum.

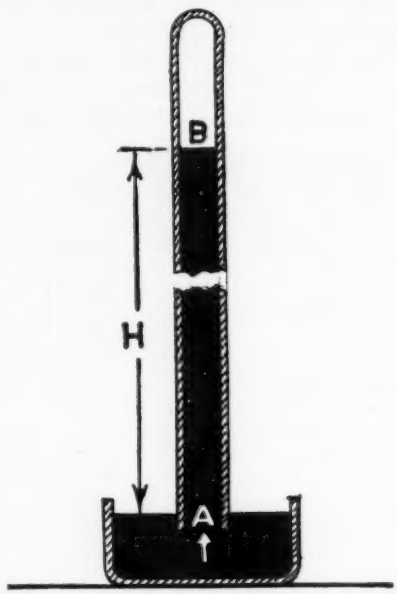
Absolute pressures are used in some engineering and scientific work and may be given in either inches of Hg or psi (lbs. per square inch), measured up from absolute zero. To visualize the meaning of 29.92 in. Hg pressure, which is atmospheric pressure, consider a glass tube 32 in. long with its lower end submerged in a bowl of mercury open to the atmosphere and with its other end connected to a vacuum pump that is so perfect that it can exhaust 100% of the air out of the tube. With the pump in operation there would be a perfect vacuum in the tube, while there would be 29.92 in. Hg pressure on the surface of the mercury in the bowl. This pressure would force the Hg in the tube up until the liquid mercury pressure at the level of the bowl just balances atmospheric pressure on the surface of the mercury in the bowl. The generally accepted idea is that the mercury is sucked up in the tube, but actually there is no such thing as suction, it is only a difference in pressure.

As another illustration, suppose the perfect vacuum pump were connected to a vacuum chamber and a U-tube with each side 32 in. long had one side connected to the vacuum chamber. Now if we had 16 in. of Hg in each side of the U-tube and the pump was started, we would have a vacuum above the mercury in one side of the U-tube and atmospheric pressure on the other side. The atmospheric pressure would press on the mercury in the open side and force it down there and up in the other side until the difference in level was just 29.92 in. Hg, which would balance the atmospheric pressure.

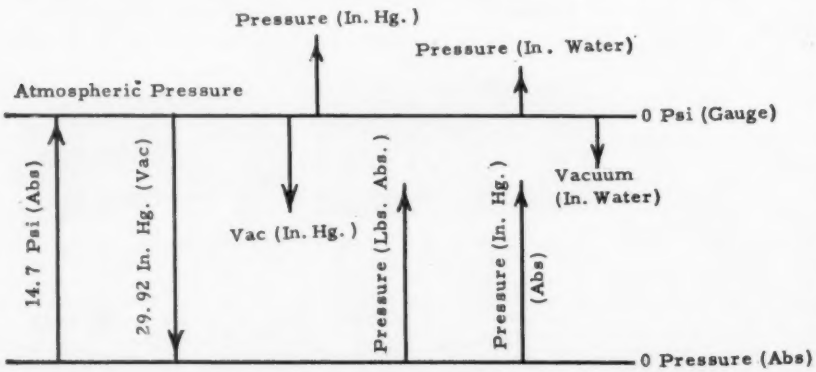
If the U-tube were connected to an intake manifold on a running engine, the depressed pressure or "vacuum" would cause the mercury to rise enough in one side of the U-tube to give a difference in level of 19 in., 20 in. or corresponding amount, depending on engine speed and condition.

Most vacuum measurements in connection with automotive service are made with a Bourdon tube type of vacuum gauge in which a curved, flattened tube held by one end tries to curve more when the internal pressure is reduced by connection to a source of depressed pressure or vacuum, and the movement of the free end is used to operate a linkage which in turn moves an indicating pointer. Such gauges are generally calibrated from "0" to "30," with the indicating hand at "0" at atmospheric pressure. When the gauge is connected to a source of depressed pressure, the pointer will indicate the amount of pressure *below* atmospheric pressure in inches of mercury or vacuum.

Pressures above atmospheric are



A mercury column. Pressure in the tube at A is the same as at the surface outside, where it is exerted by the atmosphere. At A it is exerted by the column of mercury A-B. The atmospheric pressure (14.7 lbs.) is equal to the weight of a column of mercury about 30 in. high (H) and 1 sq. in. in cross section.



Pressures above atmospheric pressure are referred to as "gauge pressure" and are positive. Pressures below atmospheric are "vacuums" or, when pressure is referred to zero of pressure, as "absolute pressure" (Abs.).

generally given in pounds per square inch, abbreviated "psi," though sometimes supercharging pressures are given in inches of Hg (above atmospheric pressure).

To get the relationship between inches of Hg and psi, it should be remembered that it takes a column of Hg 2.03 in. high to give a pressure of 1 lb. per square inch. Therefore, multiplying the psi by 2.03 (or by 2 for approximate values) the corresponding value in inches Hg can be determined. In round figures one may say that there will be twice as many inches of mercury as pounds per square inch, either above or below the standard reference pressure of 14.7 psi. abs. or 29.92 in. Hg.

WATER USED IN SIMILAR MANNER

For smaller pressures, where the values would be inconvenient or inaccurate to measure with inches of mercury, using either a mercury column, a U-tube, or a Bourdon tube gauge, water is used in a similar manner. But, being so much lighter than metallic mercury it can be satisfactorily used for measuring lighter pressures, in inches or feet of water. Very light vacuums or low pressures such as are experienced in ventilation or applications such as the full pressure controlled carburetor used on current Ford Six's and V-8's through 1956, conveniently use inches of water. Some of the test instrument makers supply a special manometer for measuring the vacuums involved in the full pressure controlled carburetor, to be used in connection with their distributor testers.

A column of water 2.30 ft. high will exert a pressure of 1 lb. psi and therefore this value can be used to convert psi to feet of water. Feet of water pressure is frequently used as the unit for expressing hydraulic heads.

For example, 2.30 ft. equals 27.60 in. of water, so 1 psi is equivalent to this value, or 1 in. of water (pressure) is equivalent to 0.036 psi. Since there will be more occasion to convert inches of water to inches Hg, the relationship is as 2.03 is to 27.6, or 1 in. Hg is equivalent to 13.6 in. of water. One inch of water is equivalent to 0.073 in. Hg. In round figures one may say that 1 in. Hg is equivalent to 13½ in. of water.

In connection with some ventilation applications, boiler furnace chimney drafts, etc., the measurement may be given in tenths of an inch or even hundredths of an inch of water. A draft gauge, which makes use of an inclined glass tube, is used for such low pressure measurements.

To summarize, all substantial pressures measured in connection with automotive service operations, such as compression pressure, oil pressure, fuel pump pressure, valve spring pressure, radiator and cooling system pressure, tire pressure, power steering system hydraulic pressure, automatic transmission pressures, etc., are measured in pounds per square inch (psi Ga.). The suffix "Ga." for gauge, is usually omitted, though with absolute pressures, measured above absolute zero of pressure, the suffix "Abs." always is used. The pressure is in the intake manifold on running engines is below atmospheric pressure and is given in inches of Hg. And, being a negative pressure when referred to atmospheric, it is a vacuum.

REMEMBER THESE FORMULAS

Mercury pressures are usually given as inches below atmospheric pressure with atmospheric pressure taken as zero vacuum. It's well to remember these:

One pound per square inch (1 psi) is equivalent to 2.03 in. Hg... One in. Hg is equivalent to 0.49 psi... Water pressure is used to measure low pressures, slightly above or below atmospheric pressure, given as inches of water pressure or inches of water vacuum (suction) . . . One inch Hg is equivalent to 13.6 in. of water... One inch of water is equivalent to 0.036 in. of Hg... One psi is equivalent to 2.3 ft. of water, or 27.6 in. of water.

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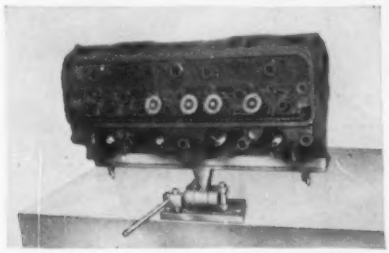
Cylinder Head Holder

The Wi-To-Co Cylinder Head Holder, recently announced by The Winona Tool Mfg. Co., is designed to make jobs, such as removing valves and



springs, a lot easier because the head can be placed at just the right height and angle. Valve grinding, the company states, will also be an easier job when the head is locked securely in the most natural working position.

The head can be rotated to lie flat on the bench for driving out or installing valve guides and seats. Heavy serrations in cups and adaptor assure positive holding in all positions. Keepers prevent thumb screws from being lost.

(Circle No. 1 on Reader Service Card)

Fuel Pump Pressure Control

The new PRESCO fuel pump pressure control recently released by Service Tool & Equipment Co., differs from conventional pressure controls in that it by-passes excess pressure, air, and vapor and returns these to the vehicle's fuel tank.

The control is said to offer no impedance or restriction to fuel flow. The maker states that flooding, vapor lock and "surge" are eliminated. Pressure can be regulated as desired, with the engine operating, up to the fuel pump maximum.

It is further stated that the constant circulation of the fuel cools it and minimizes the boiling, vaporizing and gassing of fuel in the pump and line by high engine and atmospheric temperature.

The No. 1 kit contains a special self-threading fitting for installation at the fuel tank, and an adjustable control for installation ahead of the carbu-

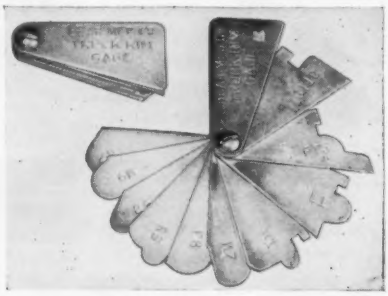
retor. Complete with heavy lead-in hose and clamps. Copper tubing is supplied by the dealer.

The same control, with hose and adapters, is also available for pressure return to the tank side of the fuel pump.

(Circle No. 2 on Reader Service Card)

Truck Rim Key Gauge

A set of rugged steel keys to help identify the right style wheel weight to use on truck rim flanges has been announced by the Bear Manufacturing Co. The No. 19040 Truck Rim Gauge has a key to match every type

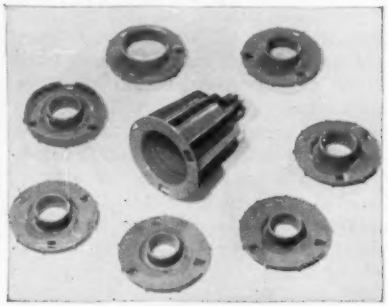


of late model truck and each key is imprinted with a number which corresponds with the correct Bear weight required. The key set will give long service and eliminate time consuming trial-and-error methods of truck flange identification.

(Circle No. 3 on Reader Service Card)

Pinion Seal Installation Tool

The replacement of pinion oil seals has long been difficult and troublesome, with often the end result being a seal not properly seating. Now it can be installed absolutely right and with considerable ease through the use of the new pinion oil seal installation



tool recently announced by Chicago Rawhide Mfg. Co.

The new C/R tool is specially designed to fit around pinion shafts, and with only seven adaptors it covers all popular cars and light trucks. The adaptors are precision molded of oil resistant, high impact plastic and hold the seals firmly in position for installation yet protect sealing lips from splines.

(Circle No. 4 on Reader Service Card)

Abrasive Grinding Discs

The Coated Abrasives Division of The Carborundum Co. announces a new fiber-backed abrasive disc for lighter grinding operations, where little or no dressing action is involved. The abrasive grain-resin bond system employed is said to make this new disc an extremely sharp, fast-cutting product with unusual resistance to loading and controlled breakdown of the abrasive coating. A clean chip-free edge is obtained when the used discs are cut down to smaller diameter. The discs are available in an aluminum oxide grit range of 24-50.

(Circle No. 5 on Reader Service Card)

Electronic Insurance Man

The Policy Matic Corporation of America announces an "Electronic Insurance Man," a patented coin-operated land-travel machine which will be offering "instant insurance" to people travelling across the United States and Canada by the Memorial Day week-end.

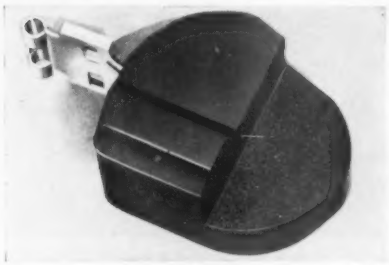
For $1.00 premium in coins, the twelve-pound battery-operated machine dispenses a policy with a $7,500 death benefit and $500 maximum medical and hospital coverage.

These machines are supervised by local independent insurance agents working through the Policy Matic franchises which have already been established in all fifty states and Canada. These machines are placed at service stations, motels, hotels, bus terminals, etc. Such national organizations as Tidewater and Avis have already joined the Policy Matic program under non-exclusive rental arrangements.

(Circle No. 6 on Reader Service Card)

Solid Carburetor Float

A new automotive carburetor float, molded from a hard cellular elastomer compound and said to eliminate problems of improper fuel level caused by leaky or damaged floats, is announced by Holley Carburetor Co.



The new chemical material is a solid, closed cell, molded compound which is said to make the float leakproof even when a hole is drilled completely through it. The new float material, called Nitrophyl, is crushproof, chemically resistant to all fuels and additives and is not affected in any way by corrosion.

(Circle No. 7 on Reader Service Card)

Air Powered Jack

Featuring a saddle adjustment from 15½ in. to a wide 57 in., the new SJ-61 two-ton air jack recently announced by Blackhawk Automotive Division, safely handles cars and light trucks from front or rear. Saddles raise from 8½ in. to 32 in.

A 15 in. front clearance from vertical column to saddles permits reaching far under vehicles to lift by the frame, pad or brackets. The main support consists of a large, rugged I-beam.

Two air valves, at the top and bottom, allow operator to apply air while standing or while positioning the lift from the ground. Mechanical safety latch that acts with an air valve secures lift automatically. A release mechanism which, when pulled, lets the jack lower automatically.

The jack moves easily on two roller-bearing rubber wheels. Overall height of jack is 46 in., weight 187 lbs. Saddles measure 4½ x 5 in.

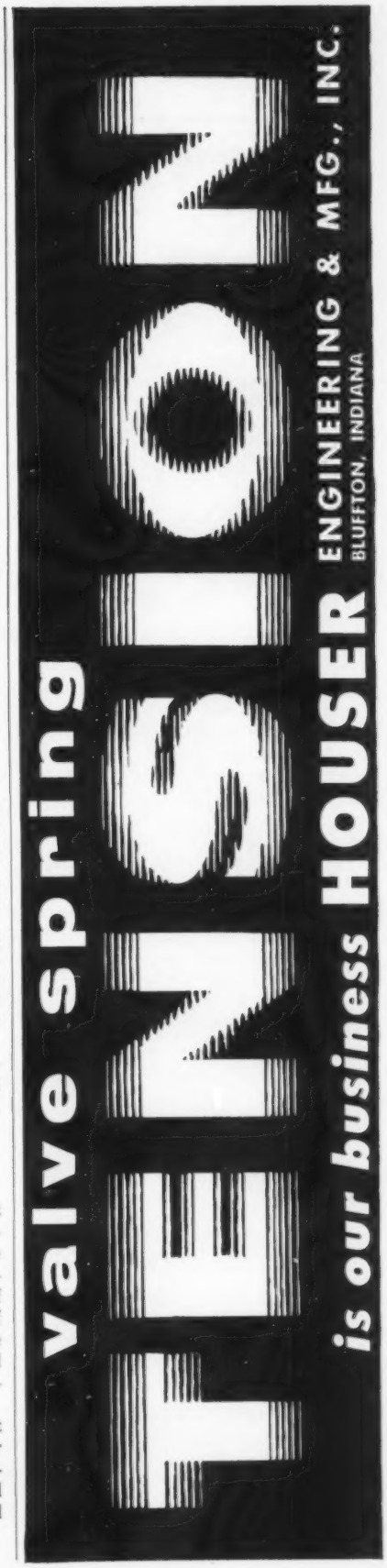
(Circle No. 8 on Reader Service Card)

Brake Cylinder Repair Kits

A merchandising cabinet assortment of "Blue Ribbon" brake cylinder repair kits has been announced by the Master Parts Division of Airtex Products, which is said to cover 92.8% of wheel cylinder repairs and 76% of master cylinder repair needs. Brake cylinder repair kits are complete and include all necessary quality replacement parts.

Assortment MK-101 contains 44 fast moving wheel cylinder and 14 popular master cylinder repair kits individually packaged in a yellow enamelled steel cabinet that is 23 in. wide and 9½ in. deep.

(Circle No. 9 on Reader Service Card)



These are new *manufacturers' products*

Brake Shoe Return Springs

The Parts and Accessories Division of Wagner Electric Corp. announces

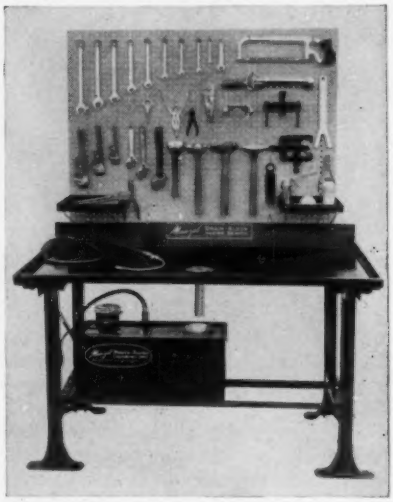
three new assortments of brake shoe return springs. The basic assortment, Wagner Lockheed part number FL-550, includes springs for the most popular models of cars. A supplemental assortment, FL-560, covers additional car applications, and assortment FL-570 includes springs for truck brakes.

Application listings are furnished with each assortment, so that correct springs can be selected immediately. Each assortment contains 96 springs—24 axle sets of 4 per axle.

(Circle No. 10 on Reader Service Card)

Drain-Kleen Work Bench

This new Drain-Kleen work bench, recently announced by Manzel, has a heavy gauge steel table top with a raised lip and gradual taper to a center drain for preventing oil dripping to the



floor. This not only provides a clean shop, but reduces accident and fire hazards. The 54" x 30" working area permits cleaning of large assemblies with ease. Smaller units can be cleaned without fear of loss or damage.

The new bench has two pieces of optional equipment. The Power-Flush Cleaning Unit, powered by a heavy-duty pump, forces a neutral solvent through the flush hose after which it is returned to the unit through the drain and filtered for re-use.

The second piece of optional equipment is a heavy-duty tool board which keeps tools handy for immediate use.

(Circle No. 11 on Reader Service Card)

Universal Carbureter Program

A new universal carbureter program for tractor and industrial engines has been announced by Marvel-Schebler Products Div., Borg-Warner Corp. under which thirteen new universal carbureters will serve to actually replace 450 former Marvel-Schebler installations.

This will serve the tractor and industrial market in two basic ways:

1. By simplifying stocking problems, dealers can now offer immediate service to customers on a local level. The new carbureters are factory calibrated, need no internal adjustment and are easily installed with no other parts to buy.

2. From the distribution and service end, the new plan enables a dealer to become an authorized Marvel-Schebler stocking dealer for a nominal amount. This plan actually eliminates the need for stocking 450 Marvel-Schebler carbureters (to say nothing of other makes) to serve the same market as the thirteen new universal carbureters.

(Circle No. 12 on Reader Service Card)

Air Conditioner for Compacts

Designed especially for compact cars, the Sportsman model is a new auto air conditioning unit offered this year by the Mark IV Division of John E. Mitchell Co.

Among special features of the unit, according to the manufacturer, is its

size which permits greater leg-room in small cars. Also, the stationary "depth-flow" louver is said to afford more efficient direction of cold air to the back seat. Squirrel cage blowers move up to 240 c.f.m., fully adequate for compacts, but not recommended as sufficient for larger cars.

(Circle No. 13 on Reader Service Card)

NO-MAR Tow Bar
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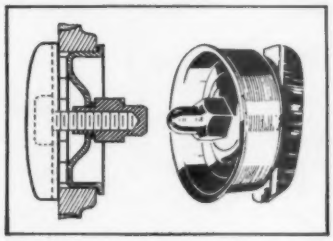
DEPT. SD POCAHONTAS, IOWA

"Anchor Seal" Core Plugs

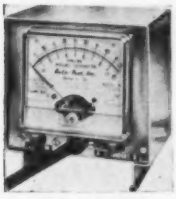
This newly-designed cup-type "Anchor Seal" Core Hole Plug, recently announced by Houser Engineering & Mfg., Inc., is a "cup-shaped" plug that is inserted *into* the core hole for a closer, tighter, permanent repair. Removal of starter, generator or exhaust manifold is said to be unnecessary.



Patented anchor screw construction enables installation in two simple steps. First, mechanic slips the anchor into core hole, tightens the nut with fingers until cup starts into hole (the cup is tapered and should start into the hole easily). Second, the mechanic tightens the nut until the flange on the cup compresses the neoprene "O" ring to a thickness of approximately 1/32" thick. Soft copper washers prevent leakage around anchor stud.

(Circle No. 14 on Reader Service Card)

"Starflash" Tachometer



The new "Starflash" Tachometer, recently announced by Auto-Test, Inc., tests 4, 6 and 8 cylinder engine rpm for all service work, including carburetor and automatic transmission adjustment.

The distortion-free plastic dial cover is said to be unaffected by oil, grease and gasoline so that it will not craze or etch. Contains two scale ranges, 0-1000 and 0-5000 rpm, and automatically adjusts to 6 and 12 volt systems. A self-contained mercury cell battery is said to provide at least 2 years of actual use. Tester has a jeweled movement, permanent magnet, moving coil and is a "D'Arsonval" type meter.

(Circle No. 15 on Reader Service Card)

Spark-O-Reg Arc Damper

The Spark-O-Reg, according to the manufacturer, Alondra, Inc., is said to furnish a low resistance path to ground for destructive primary ignition system oscillations of the coil-condenser discharge.

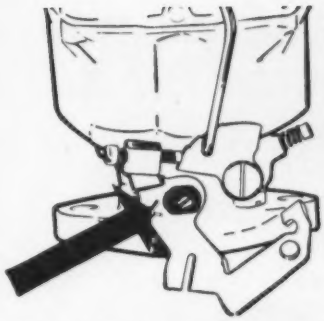
Miniaturized electronic components are permanently sealed in a protective epoxy cylinder with a connection lead at each end. It can be easily installed, since it is only necessary to connect one terminal to ground and the other terminal to either the coil or distributor primary terminal.

The Arc Damper can be used on both 6 and 12-volt systems. Installation is said to guard the ignition system against point-pitting and burning, with resultant deterioration of spark plug electrodes.

(Circle No. 16 on Reader Service Card)

Throttle Lever Tightener

A new method of permanently tightening loose carburetor throttle levers is announced by Thexton Manufacturing Co. The device, called the Thexton Throttle Lever Tightener,



locks the throttle lever in permanent position in relation to the throttle shaft. Easily installed—in most cases without removing carburetor from car—it fits nearly all makes and models.

(Circle No. 17 on Reader Service Card)

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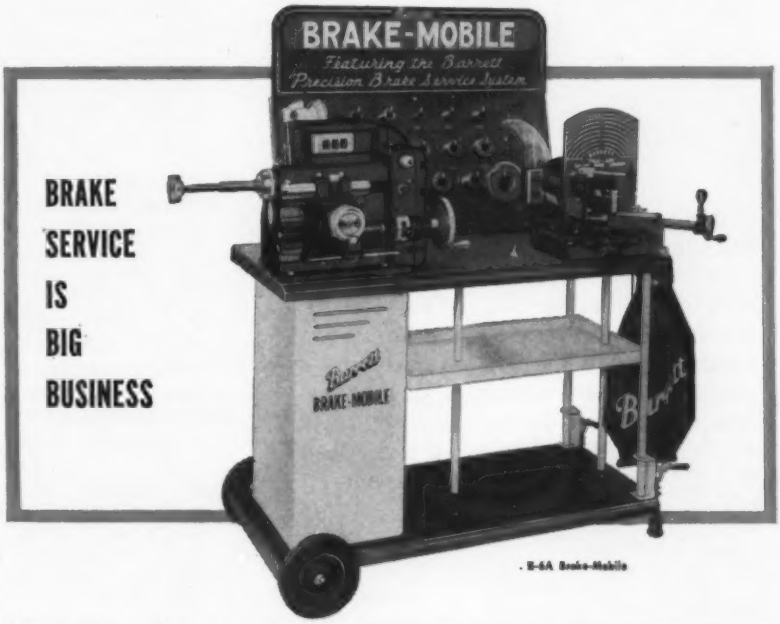

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ADVERTISERS IN THIS ISSUE

Advertiser	Key Number
APACHE MOTOR STEAM CLEANER CO.	100
BARRETT EQUIPMENT COMPANY	101
BEAR MANUFACTURING COMPANY	102
BRANICK MANUFACTURING CO.	103
BRIGGS SHOCK ABSORBER CO., THE	104
BUSKE MANUFACTURING CO., E. R.	105
CHEVROLET MOTOR DIVISION	106
DELCO-REMY DIVISION	107
DETROIT LELAND HOTEL	108
DITZLER COLOR DIVISION	109
EDGEWATER AUTOMOTIVE DIVISION	110
FELT PRODUCTS MANUFACTURING CO.	111
GOLDEN GLIDE SHOCK ABSORBER CO.	113
GRAY COMPANY, INC., THE	114
GRAYMILLS CORPORATION	115
HOUSER ENGINEERING & MFG., INC.	116
INLAND MANUFACTURING CO.	117
K-D TOOL COMPANY	118
LEE COMPANY, K. O.	119
MALSBARY MANUFACTURING CO.	120
MASTER TECHNICAL PRESS	121
McQUAY-NORRIS MANUFACTURING CO.	122
MOPAR PARTS AND ACCESSORIES DIVISION	123
MUSKEGON PISTON RING CO.	124
PERFECT CIRCLE CORP.	125
PERMATEX COMPANY, INC.	126
RAMSEY CORPORATION	127
RICHLINE COMPANY, INC.	128
RINCK-McILWAINE, INC.	129
SCHWARTZ MANUFACTURING CO.	130
SEALED POWER CORP.	131
SHURHIT PRODUCTS, INC.	132
SNAP-ON TOOLS CORP.	133
STANDARD MOTOR PRODUCTS, INC.	134
STURTEVANT COMPANY, P. A.	135
U-JOINT TOOL COMPANY	136
UNITED MOTORS SERVICE	137
VICTOR MANUFACTURING & GASKET CO.	138
WAGNER ELECTRIC CORP.	139
WALL-COLMONOY CORP.	140
WINONA TOOL MANUFACTURING CO.	141

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• COVERING the "dollar sign" side of our readers' information needs, ASD "Business Know-How" articles present management subjects from the specific automotive service shop viewpoint. They are written for owners and supervisory personnel by authors of recognized business-management ability; and are based on the actual day-to-day problems of a going automotive service establishment.

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Be sure, too, to study every issue of ASD . . . keep your information up to date. Shop operators who are "too busy" to read for what's new and better, can be "cured" of that condition by competitors who take the time to look for and act on, information about the most modern tools of the service trade.

Please send me more information about the items identified by the key numbers circled below:

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2	10	18	26	34	42	50	58	66	74	82	101	109	117	125	133	141	149	157
3	11	19	27	35	43	51	59	67	75	83	102	110	118	126	134	142	150	158
4	12	20	28	36	44	52	60	68	76	84	103	111	119	127	135	143	151	159
5	13	21	29	37	45	53	61	69	77	85	104	112	120	128	136	144	152	160
6	14	22	30	38	46	54	62	70	78	86	105	113	121	129	137	145	153	161
7	15	23	31	39	47	55	63	71	79	87	106	114	122	130	138	146	154	162
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You owe it to yourself to keep pace with fast-moving technical developments in the field. AUTOMOTIVE SERVICE DIGEST, "Know-How" and Know-What" publication of your trade, can keep you "out of debt" on what's new.

Better maintenance and repair techniques pour out of engineering labs as regularly as new designs roll off production lines. Knowing and using the new "wrinkles" means better shop work—and more business coming in the door.

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You need ASD to keep fully informed —and get your fair share of the benefits from technical advances. USE THE CONVENIENT POSTPAID CARD ABOVE TO ENTER OR EXTEND YOUR SUBSCRIPTION—TODAY.

Polarity Protector

To eliminate the possibility of a battery charger becoming obsolete or inadequate in the face of the growing use of alternator systems, Marquette Manufacturing Co. announces a com-

pact polarity protector which attaches easily to any charger. A special "thinking eye" device automatically checks connections and acts as a switch: the eye lights and current flows only when the charging leads are correctly connected to the battery terminals. It is stated that batteries can be safely charged without disconnecting battery cables because the unit is designed to block reverse flow of current, giving positive protection against damage to the alternator wiring harness and diodes.

(Circle No. 18 on Reader Service Card)

Brake Lining Gauge

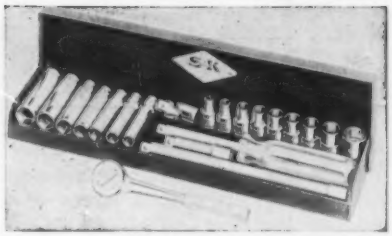
A caliper that measures brake lining wear on both bonded and riveted linings, is announced by the Raybestos Division of Raybestos-Manhattan, Inc.

The caliper has color indicators which show green when remaining lining is satisfactory, yellow to caution early signs of wear and red to show when the lining is dangerously thin. The caliper, called Safe-T-Gage, is designed to permit even an unskilled service station attendant to accurately measure the amount of remaining brake wear. A car owner can easily see the reading on the gauge, just as he sees the oil level on a dipstick.

(Circle No. 19 on Reader Service Card)

1/4" Drive Socket Set

A new 21-piece 1/4" drive socket set is announced by S-K/Lectrolite Tools. Featured are a completely new series



of seven 1/4" drive deep sockets (1/4" through 1/2") and universal joint; also nine 1/4" drive standard sockets (3/16" through 1/2") plus the S-K 60-position ratchet and 3 accessories . . . all packed in a 10 1/2" x 2 1/2" steel box.

(Circle No. 20 on Reader Service Card)

clean-up before tune-up!

Dirt and grime literally float away from automobile engines with a Graco Hydra-Clean washer. Simplifies maintenance . . . ends working with slippery, grimy parts . . . makes the completed job *look* as good as it works!

Improve service and build new business *fast* with Graco Hydra-Clean. No special wiring or bulky equipment needed . . . fits on your own containers. And it's great for other cleaning jobs around the station, too!

The Graco "500" Hydra-Spray

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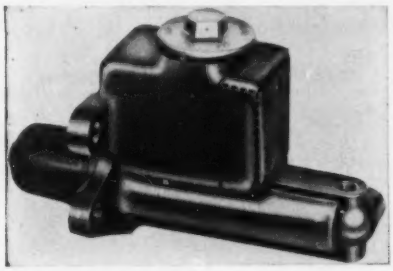
These are new *manufacturers' products*

Replacement Master Cylinders

A complete group of replacement master cylinders with a larger fluid capacity has been announced by Eis Automotive Corp. for use on all GM 1959-60 passenger cars. The reserve tank has been increased in size to



effect a 20% additional reserve of brake fluid.

According to the manufacturer, the increased fluid capacity creates an extra margin of safety. They are precision-made and accurately machined with a mirror-like internal finish.

(Circle No. 21 on Reader Service Card)

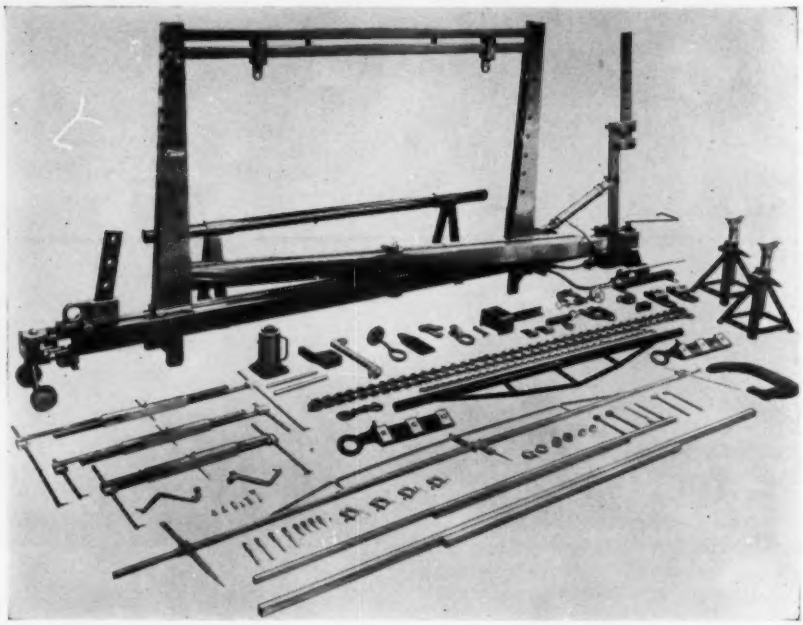
Portable Body-Frame Aligner

A compact, versatile, mobile body-frame aligner has been designed by John Bean Automotive to perform practically all body and frame repair operations on conventional construction cars, with particular emphasis on the performance of body and frame corrections simultaneously on unitized construction cars. Requiring a minimum of space and original investment, the aligner represents an ideal way for retaining service business it has been necessary to farm out.

Many exclusive features are incorporated into the aligner. The dual, tubular main beam mounted on rollers provides mobility, allows the aligner to be used anywhere in the shop. The lateral twist beam and extendible tool support bars permit full flexibility of hook-ups, over or under the car, inside or outside the car. This versatility not only provides faster and fewer hook-ups, but is said to also permit most body-frame corrections without removing sheet metal or upholstery.

Power jacks or holding tools clamp anywhere on the main beam, twist beam or tool support bars for further flexibility. The result is a series of exclusive set-ups such as roof or body pull-downs, all-angle jacking set-ups inside the car, diamond frame corrections by pushing from within the frame, single set-up camber decreasing corrections and others.

(Circle No. 22 on Reader Service Card)



Auto-Moly Engine Treatment

Auto-Moly Engine Treatment, available from Newhouse Automotive Industries, is made from molybdenum disulfide (MoS_2) which plates friction surfaces with a tough, slippery, long-lasting, metallic film that is said to remain, even when oil or grease is gone. When added to the engine's lubricating oil, it is said to prevent excessive friction, wear, galling and scoring of surfaces inside the engine.

By adding a can to the crankcase every-other-oil-change, the manufacturer claims longer engine life, much less friction, quieter, smoother running engine, better gas mileage.

Also available is Gear-Moly for transmissions and differentials. According to the manufacturer, this heavy fluid, rich in MoS_2, makes shifting smoother, much easier. Gears are said to run quieter and cooler, with wear reduced on gear teeth and shifting forks.

(Circle No. 23 on Reader Service Card)

Extra Long Wrenches

A line of twenty-four Armaloy extra long combination open end-box pattern wrenches with nominal openings ranging from 3/8 in. to 2 in. and

lengths from 7 to 30 in. is announced by Armstrong Bros. Tool Co.

These wrenches are said to be particularly useful where additional leverage is required to loosen tight nuts.

(Circle No. 24 on Reader Service Card)

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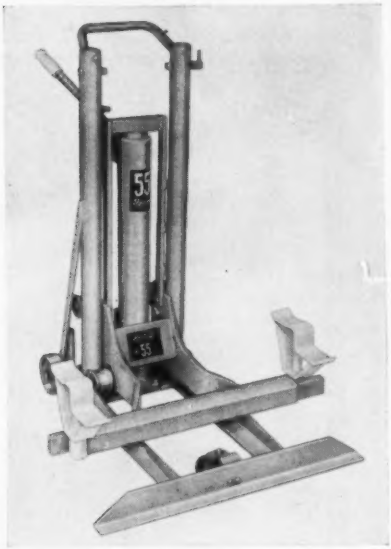
LOOKING FOR A JOB? USE OUR CLASSIFIED COLUMNS—PAGE 80

Bi-Level Swivel Saddles

To meet the special requirements faced in one-end lifting of 1961 automobiles, Hein-Werner now provides a totally new bi-level swivel saddle design on their "55" Packer and



"Screwball" twin saddle service jack models.

The bi-level principle offers a choice of two level load lifting surfaces with increased saddle span and reach to properly fit all types of bumpers, brackets, pads, or frame members. Bi-level saddles provide better stress-relief by using two-point bumper support; takes full advantage of the lifting range of the jack (either end of vehicle can now be raised up to 33 in.); clears under-car obstructions.

(Circle No. 25 on Reader Service Card)

Gen-Alt-Reg Tester

Allen Electric and Equipment Co's. Model 20-09 Generator-Alternator-Regulator Tester will test 6, 12, and 24-volt generators and alternators at speeds sufficient to produce full output up to 1500 watts with or without voltage and current regulators. It tests

D.C. and A.C. generators, alternators, cutout relay, field relay and light relays, current-voltage regulators, standard and double contact regulators and transistor regulators.

The tester includes such features as adjustable regulator mounting bracket, field circuit breaker, forced air cooling, quick acting generator vise, motor reversing switch, and a heavy-duty 3 hp (220 volt) motor to drive generators from 800 to 6,000 rpm, with a variable speed control.

The tester is supplied with complete instruction manual, and latest generator-alternator-regulator specifications plus personal instruction by an Allen factory-trained representative.

(Circle No. 26 on Reader Service Card)

Brake Bleeding Adapters

Grigg Specialty Tools announces a set of newly designed die cast, full cover brake bleeding adapters which operate with all makes of brake bleed-

ers. Their new flat shape is said to prevent build-up of excessive brake fluid over the rim of the master cylinder. Rubber gaskets cemented in a groove in the cap eliminates fluid spillage, prevents slippage and squeeze-out of the gasket causing leaks during the pressure bleeding operation.

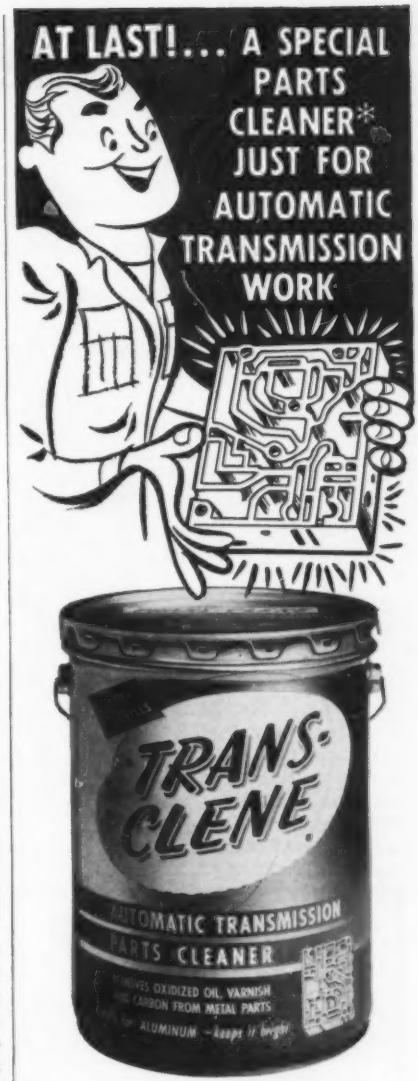
(Circle No. 27 on Reader Service Card)

Air Conditioning Servicer

Air conditioning service can now be performed with the heat of the refrigerant controlled through use of the Air Conditioning Charging Station available from Hinckley Myers Co. By controlling the temperature the refrigerant is always introduced into the high side eliminating "slugging" the compressor.

This compact, portable unit can test, evacuate and charge all automotive-type air conditioners. All the necessary equipment is designed "into" this unit, including manifold, gauges, vacuum pump, charging cylinder and hoses.

(Circle No. 28 on Reader Service Card)


AT LAST!... A SPECIAL PARTS CLEANER* JUST FOR AUTOMATIC TRANSMISSION WORK
TRANS-CLENE
AUTOMATIC TRANSMISSION PARTS CLEANER
REMOVES OXIDIZED OIL, VARNISH & CARBON FROM METAL PARTS
FOR ALUMINUM — keeps it bright

GRAYMILLS

*TRANS-CLENE

TRANS-CLENE cuts deep-down varnish and carbon deposits from every corner of intricate valve bodies, pumps, and other hard-to-clean transmission parts. The heaviest oxidized coatings soak loose and easily brush or rinse away. Loosens gaskets for faster, simpler removal. Safe on aluminum. Available in special 16 gal. size with dip basket and cover. Also in 6, 30 & 55 gal. drums. Send for catalog.

TRY TRANS-CLENE. YOU'LL SEE THE DIFFERENCE IN ITS CLEANING POWER OVER ORDINARY SOLVENTS. YOU CAN GET IT FROM YOUR JOBBER.

WRITE FOR FREE BOOKLET / "Cleaning procedures for Automatic Transmission parts"

Provides step by step cleaning procedures that insure quality jobs and cuts down on costly comebacks.

GRAY-MILLS GRAYMILLS CORPORATION

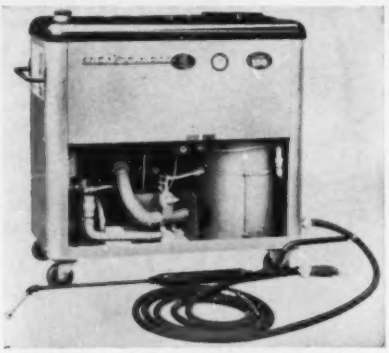
3736 N. LINCOLN AVE. CHICAGO 13, ILL.

These are new *manufacturers' products*

Steam Cleaner

A new, larger-capacity, oil or gas-fired steam cleaner to replace former 120-130 gph sizes, is announced by Malsbary Mfg. Co.

The Model 150 is the same size



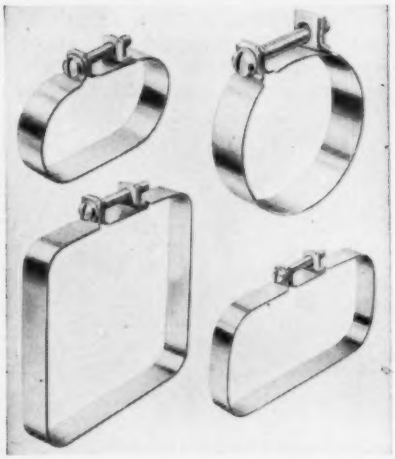
(45" x 21" x 43") as the Model 130 it replaces, but pump capacity has been increased to 135-150 gph by redesigning pump components. Slanted burner is said to create better flame pattern and thus improve heating efficiency.

The new unit retains Malsbary's new orifice and nozzle design, which produces a uniform cleaning pattern of large droplets, said to increase cleaning efficiency 10 to 20 per cent.

(Circle No. 29 on Reader Service Card)

Wittek Auto Clamps

Designed and produced to meet fast-assembly hose connection specification requirements of automotive, farm, construction equipment, machine tool, appliance and other original equipment manufacturers, the versatility of the Wittek Auto Clamp now makes



it available in various band shapes and sizes for connecting duct, securing insulation and many other unusual clamping applications.

Wittek clamps are made from cold-rolled strip steel, plated for corrosion resistance. They are made with a solid flat band ½" wide, of proper gauge to provide strength, flexibility, and a leakproof seal. Standard auto clamps are furnished with a plated fillister head screw and nut for easy tightening with a screwdriver. They are also available with stainless steel band and other screw head styles and materials.

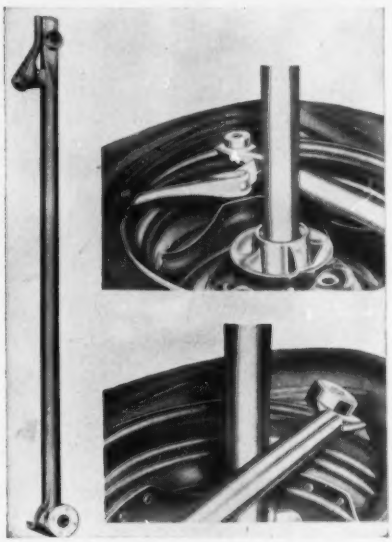
(Circle No. 30 on Reader Service Card)

Roll-On Tire Tool

Three polished rollers that roll instead of slide tire beads on and off wheel rims are exclusive features of a new combination take-off and put-on tool recently announced by Coats Co., Inc.

Said to be the only combination tool to employ rollers on both the put-on and take-off ends, the tool has another feature that makes it unique . . . it uses a steel finger to automatically keep the tire beads from reseating as the take-off rollers lift them above the wheel rim.

Coats Combination Tool "61" uses two rollers on the take-off end to



virtually eliminate friction. Both ends of the tool are made of heat-treated steel for exceptional strength.

(Circle No. 31 on Reader Service Card)

Air Conditioner for Compacts

Climatic Air Sales, Inc. announces a "Compact" automobile air conditioner designed exclusively for compact cars. Overall dimensions of the unit are: 12⅝" long; 5½" high; 11½" deep. Cool air is distributed by a

squirrel cage type blower with output of approximately 295 c.f.m. Unit has three round grilles in face of unit and entire evaporation case can be mounted in a very small space.

Newly developed Climatrol valve provides constant cooling to the temperature set by the rider regardless of town or country driving. As the heat increases on the outside, inside of the car is kept at a constant temperature. A "pre-cool" position on the control permits coils to operate cool without running fan.

(Circle No. 32 on Reader Service Card)

B-6

FLEET

HYDRAULIC

END LIFT

Large 10" semi-pneumatic rubber wheels.

Lifts both front or both rear wheels of all cars and light trucks, quickly, easily.

Transmission adapter and high lift attachment available.

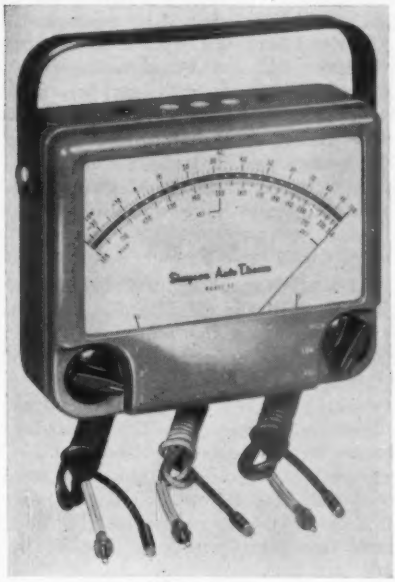
NAPA

Your NAPA Jobber is a good man to know. See him for the complete line of Fleet lifting equipment.

EDGEWATER AUTOMOTIVE DIV.
St. Joseph, Michigan

Temperature Tester

Testing the performance of a car's air conditioning system has heretofore been a rather difficult job. However, according to Simpson Electric Co.,



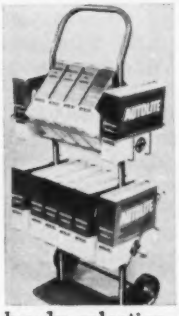
their new Model TT temperature tester makes it easy.

With the mechanic at one spot outside the car, temperatures at three different places can be taken at the flick of a switch, for instance: outside air, conditioner intake air and air being discharged into the car.

Also, the Simpson tester is versatile: Its two scales and wide range, (−50°F. to +100°F. and +100°F. to +250°F.), and 15' long leads, make it handy for determining oil temperatures, transmission temperatures, thermostat opening temperatures, etc.

(Circle No. 33 on Reader Servcie Card)

Cut-to-Length Ignition Cable



Complete ignition coverage for 197 cars in just 12 boxes is possible through use of cut-to-length "balanced resistance" ignition cable recently announced by The Electric Autolite Co.

Instead of the box-a-car system, the dealer just uses a handy selection chart to pick a precut length with a preassembled, factory controlled spark plug terminal for each cylinder.

(Circle No. 34 on Reader Service Card)

Rear Wheel Grease Seals

Offering twelve new seals, Champ-Items, Inc., now covers all popular car makes and models with their rear wheel grease seal assortment. According to the manufacturer, the new units may be installed without removing either the original bearing or seal, and require no special tools or training to install.

The two-piece seals are available as Champ No. 349 through 360, and as a balanced assortment (No. 348) The assortment contains 30 pair of grease seals in numerical ratio to the expected demand.

(Circle No. 35 on Reader Service Card)

Portable Parts Cleaner

A portable 20 gallon Mini Dip parts cleaning machine is announced by Magnus Chemical Co. which has a 45 pound capacity.

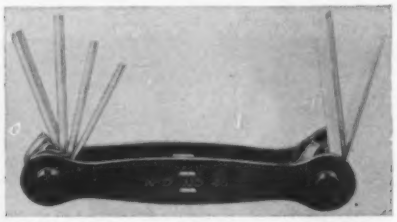
The unit consists of a 20 gallon open-head drum—packed with 15 gallons of decarbonizing, desludging, devarnishing compound—a basket that fits inside the drum and the compressed-air-operated, automatically agitated Mini Dip unit that fits over the top of the drum.

The Mini Dip combines the chemical cleaning action of the solution with the dirt-shearing mechanical action of the up-and-down agitation of basketed parts in solution. Contaminants—carbonized oil, sludge, dirt and metal chips are pressure-flushed from recesses and pockets that could not be reached by conventional hand brushing and spray cleaning.

(Circle No. 36 on Reader Service Card)

Metric Hex Key Pack

A handy and necessary tool for work on foreign cars or engines where socket screws are used is the new Metric Hex Key Pack recently announced by the K-D Tool Co.



The new pack contains six popular sizes for work on foreign equipment. They are 2mm, 2½mm, 3mm, 4mm, 5mm and 6mm. All six keys are mounted in a sturdy metal pocket case, three and seven-eighths-inches long folded. The case is assembled with bolts so that the keys may be easily replaced.

(Circle No. 37 on Reader Service Card)

The easy, safe way to MOVE WRECKS!

SCHWARTZ

Hydraulically operated
RAMP HOIST
with WINCH

Eliminates towing — Saves on time and labor

- Mounts without removing truck frame cross member.
- Carries up to 14 tons.
- Fits all trucks 84" to 174" cab to axle.
- Hydraulic controls at *the side* of the ramp to give operator unobstructed view of operations.
- New combination fold-down approach plate, bumper, and trailer hitch.

Here is the profit maker every auto salvage firm or body repair shop needs. Mounted on a conventional single or tandem axle truck, the SCHWARTZ RAMP HOIST requires just *one man* to load, transport, and unload wrecked autos because the entire job is done hydraulically. Lower the ramp in front of the damaged vehicle, attach the winch cable and the hydraulically powered winch pulls the wreck onto the ramp. The ramp is then lowered into place and you drive off at highway speeds. No hazardous towing. No need to disconnect transmissions.

You buy the SCHWARTZ RAMP HOIST as a complete unit . . . ramp, hydraulic mechanism, power take-off, and controls. Fold-down approach plate optional.

DESIGNED FOR SINGLE OR TANDEM AXLES. ALL MAKES OF TRUCKS.
For full information, write Dept. RH-5

SCHWARTZ Manufacturing Co.
Lester Prairie, Minn.

"Spokes". . .

(Continued from page 10)

mobile Manufacturers Association, is becoming more ignored every year. Stock car racing is growing as a spectator sport, while economy runs and long-distance endurance tests are being featured in advertising and news items to about the same extent as before the "ban."

While the car factories disavow any backing of these affairs, it is a known fact that the engineers from the various companies, both car manufacturers, as well as the makers of parts, are very much in evidence at these events.

During NASCAR's Speed Week at Daytona Beach, Fla., E. R. Stroh, vice president of Electric Autolite Co. announced a master mechanics award to be presented to mechanics selected by their fellow mechanics in all divisions of the industry—motor sports, independent garages, service stations, car dealers, vocational school graduates, etc., in various classifications.

Stroh is a member of the newly-formed all-industry study committee named to recommend a comprehensive program to recruit, train and place the thousands of skilled men needed to keep pace with the nation's growing car population. The first motor sports mechanics award will be announced during the next Speed Week.

* * *

Questioned about recurring reports in business circles that Willys Motors, Inc., will merge or sell its business to American Motors Corp., S. A. Girard, president, has stated that the company is not negotiating with any firm and is not for sale. However, he confirmed that Willys and American Motors Corp. are discussing the possibility of a joint engine facility in Mexico where both companies have assembly plants.

* * *

At a press meeting held recently in Detroit, Seiberling Rubber Co. showed a new passenger tire which uses both rayon and nylon cords. They have two plies of nylon cord fabric and two of Tyrex, a high-tenacity rayon. Just about everybody in the industry knows the fierce competition that exists between rayon and nylon for tire cord material. It looks as if the new application of the old saying, "If you can't fight 'em, join 'em," applies to this situation!

One of the advantages claimed for the new construction is that it eliminates the temporary out-of-round condition due to the stretching qualities of nylon producing what the tire industry calls "morning thump." The new tire construction has been trademarked by Seiberling as "Nytex".

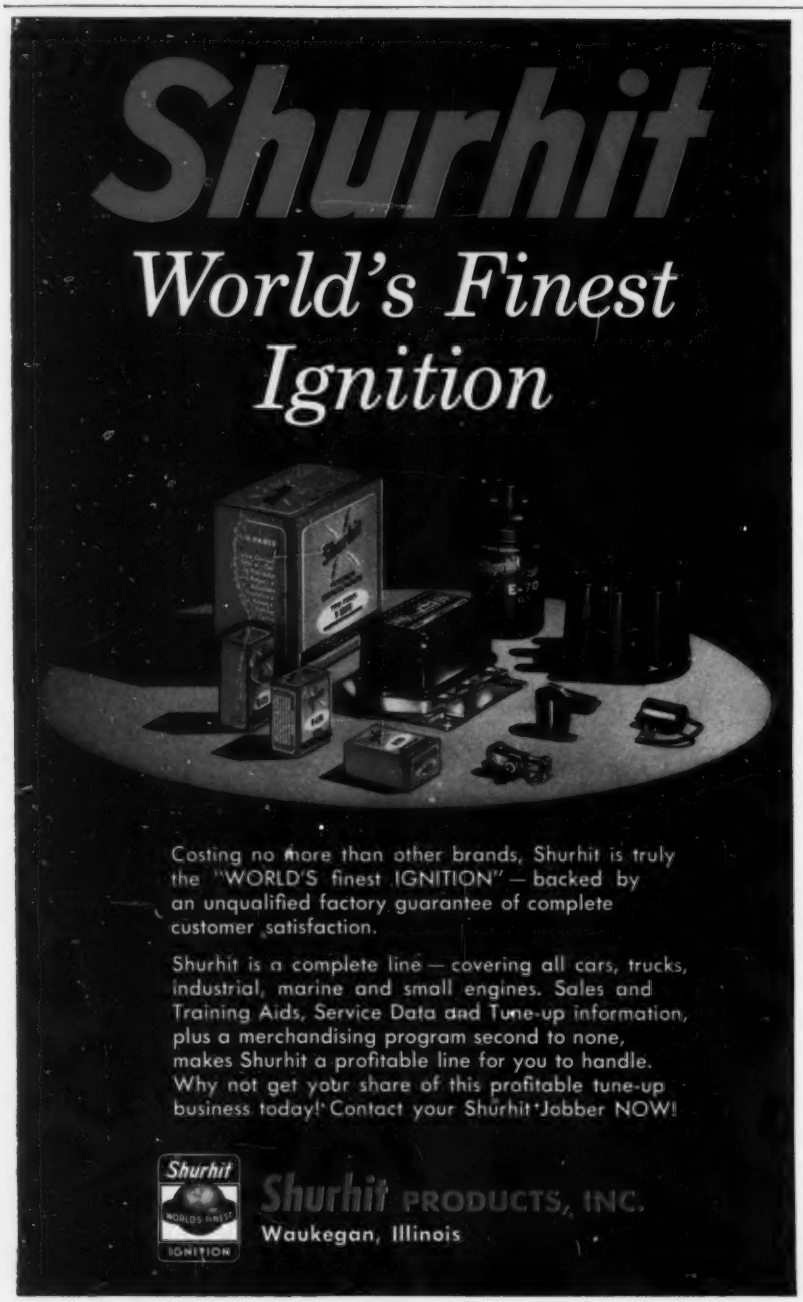
* * *

The Board of Directors of the Automobile Manufacturers Association has approved a $175,000 grant to the Automobile Crash Injury Research program of Cornell University. The Cornell award is in addition to $1,706,000 in grants for the 1960-61 fiscal year previously announced by AMA to promote traffic safety and efficient use of the highways. This is the third successive year in which AMA has granted funds for the Cornell program to make a total contribution of $500,000.

The program involves the statistical analysis of traffic accidents to determine the nature of passenger injuries and their relationship to automobile design.

* * *

At a recent meeting in Toronto, Dr. Irwin J. Schaffner of U. S. Rubber Co. told fellow scientists that while it is now possible to make a man-made duplicate of natural rubber, much progress must still be made toward solving the complex chemical reactions of vulcanization, the process that makes natural rubber a practical material for tires, footwear and other articles.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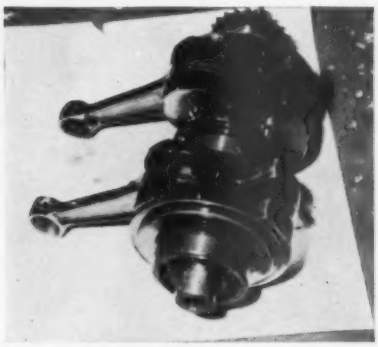
Waukegan, Illinois

These Things Do Happen

● THE OWNER of an imported automobile knew of a leaking seal in his engine, but he found that if he maintained the oil level only about half of the normal height that he would not lose oil through the defective seal. He therefore saved himself the cost of having the seal replaced (or so he thought).

While on a fast trip he noticed the engine was getting noisy, indicating low oil, but he thought he could get to the next town before putting in additional oil. However, the engine did not agree with him—there was a clatter of metal as it came to a stop.



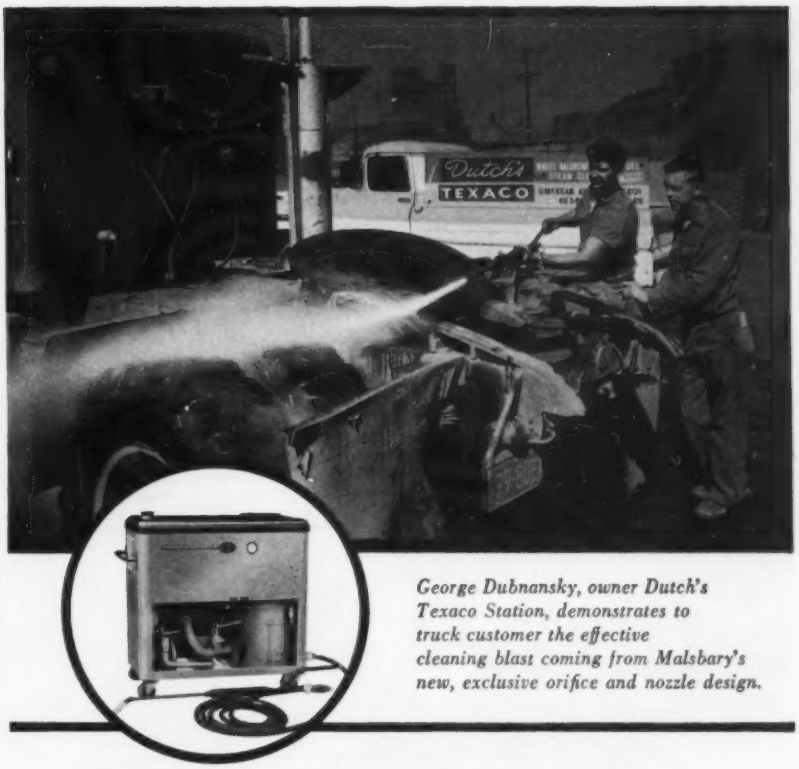
The imported car crankshaft which is an assembly of rods, bearings (roller) and crank throws and crankpins, pressed together. If anything goes wrong, there is no repair to be made—the entire assembly has to be replaced.

There was nothing to do but get a tow back to town. The engine was removed, a major operation, as this car has a front wheel drive. It was necessary to pull the entire power plant and transmission.

On disassembling the engine it was found that one of the two pistons had pulled apart at the piston pin hole. The top half of the piston had jammed against the cylinder head and the connecting rod had struck the piston part so hard it deformed the upper end.

This would not ordinarily be so bad except that on this engine the crankshaft has roller bearings on both connecting rod and mains, and the crankshaft is assembled by pressing the crank pins into the crank throws after the rods and roller bearings are put in place. Therefore there is no repair possible on the crankshaft, and the whole assembly of shaft, bearings and rods has to be replaced.

The sad owner of the car found that his presumed economy was not so economical after all; the bill for the new shaft plus the labor amounted to $235. To replace the defective engine seal would not have cost over $25.00, so he can charge $210.00 up to experience—a rather high price to pay.



George Dubnansky, owner Dutch's Texaco Station, demonstrates to truck customer the effective cleaning blast coming from Malsbary's new, exclusive orifice and nozzle design.

"Malsbary Model 130 Outperforms Any Steam Cleaner We've Ever Used"

Says "Dutch" Dubnansky: "We must have a reliable steam cleaner. We tried at least 5 other makes and none operated more than 30 days without numerous mechanical failures. Our Malsbary runs without any trouble."

Dubnansky cleans 90 or more trucks and used cars monthly at his Texaco station in Charleroi, Pa., gets big cleaner performance, at low cost, from his Malsbary 130. It delivers a full 130 gph of hot solution. Malsbary's exclusive new orifice and nozzle design produces a harder-hitting stream of larger droplets, in a more uniform cleaning pattern . . . gives performance superior to competitive 150-180 gph cleaners.

YOU CAN'T LOSE. Buy a Malsbary Model 130 and try it for 10 days. If it doesn't perform as stated in this ad, return it, and our dealer will refund your money. Call him now, or mail coupon.

MALSBARY

Malsbary Manufacturing Company • 845 92nd Avenue • Oakland 3, California

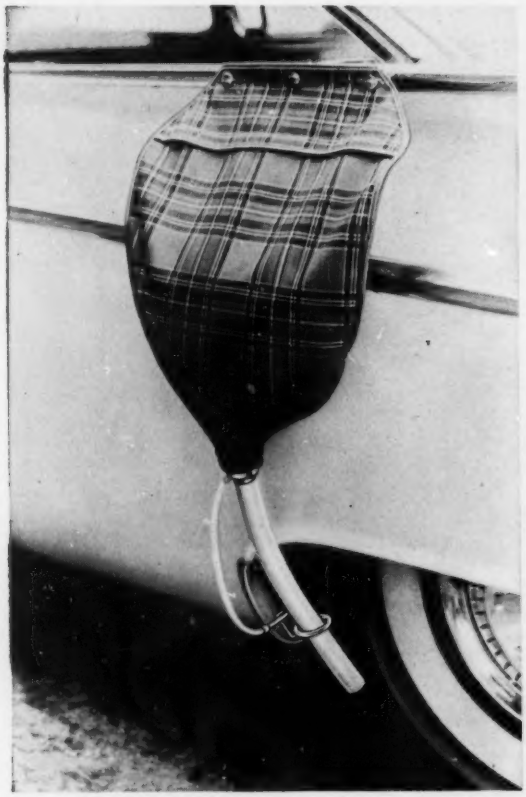
Malsbary Manufacturing Co. / 845 - 92nd Ave., Oakland 3, Calif. 153

I would like ☐ literature describing Malsbary 130 cleaner; ☐ information on buy-and-try plan.

Name_____ Position_____

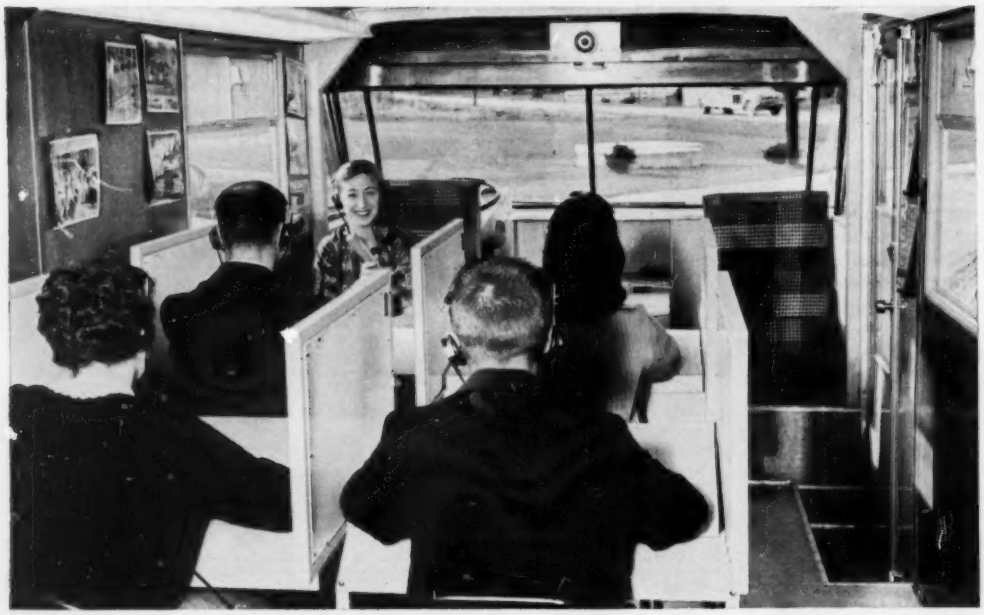
Company_____

Address_____

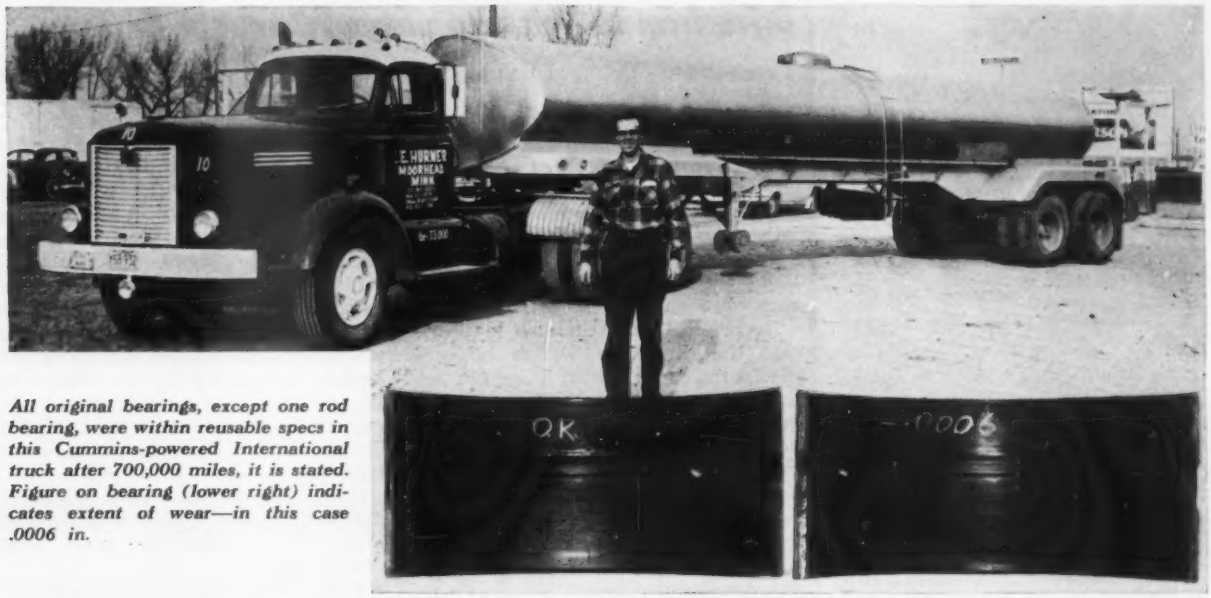


Push buttons and plastics combine to contribute to safe winter driving through the Napco Skidmaster. The detachable grit spreader is controlled by a vacuum release valve. A pushbutton control on the dash releases a flow of grit or sand under both rear wheels through flexible plastic tubing. There are no holes to drill or electrical wiring. Connection is by a hose to the windshield-wiper line or vacuum spark advance.

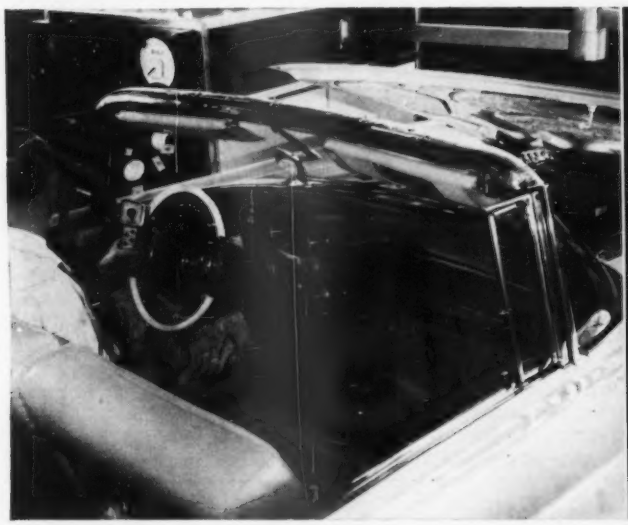
The World's largest tires designed for use over snow-covered terrain, had to be individually "shoehorned" into boxcars with oversize doors at the loading docks of The Goodyear Tire and Rubber Company recently. Nearly 10 ft. in diameter, the tires were shipped to Fort Eustis, Va. and then to Alaska for the U.S. Army's "Exercise Willow Freeze" in February.



Designed for both school and industrial use, this new Dodge mobile laboratory is said to be ideal for classroom purposes or as a field office for contractors, geologists, architects, oilfield crews, television and radio stations, civil defense and hospital disaster teams, and radar crews.



All original bearings, except one rod bearing, were within reusable specs in this Cummins-powered International truck after 700,000 miles, it is stated. Figure on bearing (lower right) indicates extent of wear—in this case .0006 in.

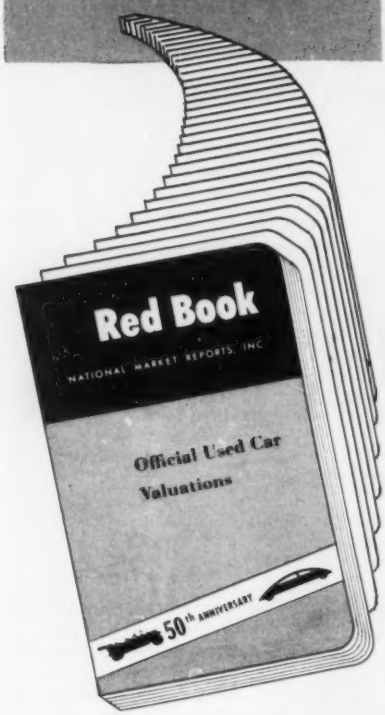


The EAGER (Electronic Audit Gager) is used by Ford in checking the operation of all electrical components after final assembly of the complete system. EAGER not only pinpoints malfunctions, but it also signals future possible trouble spots. A hand control directs and records test results.

PHOTOS from here and there

Well over a million Syrians and Arabs were impressed as they witnessed demonstrations of Inland radiator servicing equipment in the recent U.S. Exhibit at the International Trade Fair, Damascus, Syria. The Inland exhibit was held under the auspices of the Office of International Trade Fairs, U.S. Department of Commerce.

50 YEARS OF DEPENDABLE SERVICE



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NATIONAL MARKET REPORTS, Inc.

900 South Wabash Avenue
Chicago 5, Illinois

Drive from Detroit to Chicago Without A Battery

. . . demonstration proves advantages of alternator

● TWO NEW CARS—a Plymouth and a Valiant—both running the full distance drawing all their electrical power off their alternator, without a battery, recently traveled the 328 miles from Detroit to Chicago to complete what is believed to be the first such trip in automotive history. The cars were on the road for 5½ hours.

Purpose of the trip was to prove that the alternator, which has replaced the conventional DC generator on all Plymouth and Valiant cars, produces enough electrical power to keep cars running at idle, as well as at all driving ranges, even with a heavy electrical load and without resorting to energy stored in the battery.

In making the trip, the cars had to come to a complete stop 24 times each, yet the engines never stopped running.

According to Plymouth's chief engineer, Jack E. Charipar, "A generator-equipped car, without a battery, will stall when it comes to idle, because the generator by itself does not produce enough electrical energy to keep the engine running." In a demonstration to illustrate the amount of electrical energy produced by the alternator at idle, Plymouth engineers disconnected the batteries of an alternator-equipped 1961 Plymouth and a generator-equipped 1961 competitive car. The competitive car stalled immediately while the Plymouth engine continued to run.

Engineers then turned on the radio, heater, windshield wipers and dome light on the Plymouth. The engine continued to run, in spite of the additional electrical load.

As further emphasis of the battery-charging quality of the alternator, an alternator-equipped '61 Plymouth and a generator-equipped '61 competitive car, both with batteries too weak to turn over the engines, were started with a jumper wire and allowed to run at idle for a short period of time. When the engines were shut off the alternator had charged the Plymouth battery sufficiently for the engine to be re-started; the generator-equipped car could not be re-started, and the battery had even grown weaker from idling.

According to Plymouth's engineers the demonstrations proved two things important to motorists faced with winter driving:

1. The alternator, unlike the DC generator, produces considerable electrical power at low engine speeds and at idle. This protects the motorist against battery failure, particularly in slow stop-and-go traffic with headlights, heater, defroster, windshield wipers and the radio turned on.

2. At the same time, the alternator charges the battery at low engine speed and idling stages, keeping it strong and capable of re-starting the car should the engine stall in traffic.

In addition to the winter driving advantages of the alternator, it is said to have many year-round features which make it highly desirable. These are: longer battery life . . . surer starts . . . more trouble free . . . lower maintenance costs . . . and at 12¾ lbs., the alternator is nine pounds lighter in weight than a conventional generator.

Routine Cable Inspection Forestalls Engine Trouble

Corroded, frayed or partially broken battery, starter and generator cables frequently are an indication that the interior metal strands have become brittle, and that the entire cable is apt to break. Cables in this condition should be replaced to eliminate high resistance in the various circuits which may result in eventual starting failure if not corrected.

Check Seal Between Manifold and Head

To assure a tight seal between the manifold and cylinder head of the 6-cylinder overhead valve engine used in the 1961 Lark VI models, the factory advises checking the manifold-to-cylinder head retaining clamps to see that they are correctly positioned on the retaining studs and against the manifold.

The triangular shaped clamps must be placed over the studs and against the manifolds so that two of the bearing surfaces (two ends of the triangle) are against the intake manifold and the other bearing surface (other end of the triangle) is against the exhaust manifold.

"How is my car's transmissionary?"

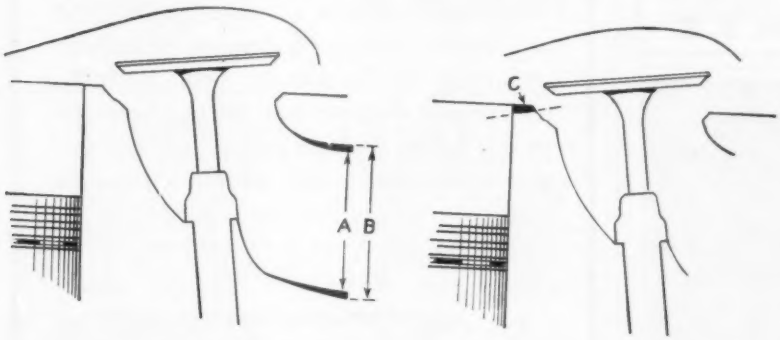
BRUSHING UP ON THOSE EASY-TO-FORGET THINGS

Refresher course

✔ *Porting—Relieving Block and Manifold*

• A WAY TO INCREASE power of a stock L-head engine is by increasing the weight of the mixture. This can be done by "porting" and "relieving" as illustrated.

Porting means to increase and smooth out the mixture flow passages in the block and manifold. Note that the diameter of the valve port B, is larger than A, the latter the original diameter of



the port. The solid block area is cut away by using various grinding wheels. Care must be taken not to grind into the water jacket.

The enlarged ports (in block and manifold) should be matched, to avoid a ridge.

Relieving applies to tapering the block area on L-head engines between the valve seat and cylinder bore, as at C. The amount depends on the uppermost travel of the top ring. Surfaces should be gradual and smooth.

●

C-6
FLEET SHOP CRANES
Make heavy work easier, faster, safer.
½ ton — ¾ ton 1 ton — 2 ton capacities
Move these handy cranes anywhere in the shop.
Save time, money and backaches in lifting and moving heavy machinery, motors, crates and boxes.
Rugged all steel construction for years of service.
Truck mounted cranes, 1½ and 1 ton hydraulic and electric-hydraulic
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CASS AVE. AT BAGLEY
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- V-ways with automatic take-up for wear
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SUPER FINISH AND EXTREME ACCURACY

MODEL K403C

The only valve refacer that offers all automatic pre-load compensation for wear. No mechanical adjustments necessary, or expensive service or parts replacement. Machines retain original fine accuracy throughout years and years of service.

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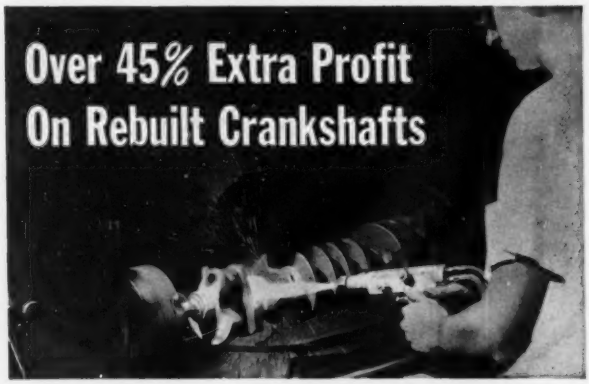

COSTS SLASHED FOR ENGINE REBUILDING FIRM USING COLMONOY C-290 AND THE SPRAYWELDER

Engine Rebuilders Corporation of America, Fair Lawn, New Jersey, reports that with Colmonoy C-290, a special purpose alloy high in nickel and chromium, they turn out 23 to 27 crankshafts per day as compared to 16 to 18 per day with older wire metallizing method. Not only are labor costs lower, but costs for material also are less. Customer reaction has been excellent.

Learn more about the Spraywelder, Colmonoy C-290, and other Colmonoy alloys for automotive use. Write for full information today.

HARD-SURFACING & BRAZING ALLOYS

WALL COLMONOY CORPORATION

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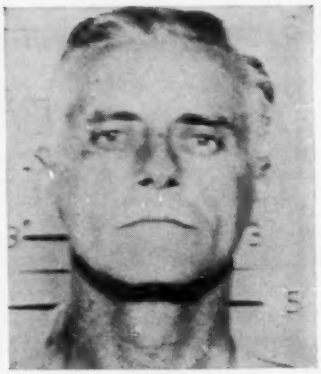

EDWIN THOMAS HUBER, also known as EDWIN T. HUBER, absented himself from the 3802nd Supply Squadron, Maxwell Air Force Base, Alabama, on September 26, 1958, and he was declared a deserter by military authorities on October 25, 1958. HUBER's background discloses that he has been employed as an auto parts clerk and his former acquaintances and employers consider him to be an excellent auto mechanic.

DESCRIPTION

Age	45, born June 27, 1915, Philadelphia, Pa.
Race	White
Sex	Male
Height	5' 11"
Weight	170 to 200 lbs.
Eyes	Green—hazel
Hair	Grey—brown
Scars & Marks	First joint right index finger missing.

Anyone having information concerning the present whereabouts of this person please contact your local FBI Office.

The telephone number for the nearest FBI Office may be located on the first page of local telephone directories.

CORRECTION

In order to straighten out the chemically exact readers, the following will correct a rather loose statement which appeared on page 76 of the March issue in column 2, line 1. The information on anti-freeze inhibitors should have read as follows:

A commonly used anti-freeze inhibitor is borax, (sodium tetraborate). The exact percentage of borax in an anti-freeze formulation is of secondary importance. The important consideration is the performance attained with borax *and* the supplemental or adjunct inhibitors. It is essential to determine the proper concentrations of *all* inhibitors for maximum corrosion protection. Excessive quantities of any single inhibitor could detract from aluminum protection. The proper balancing of inhibitor concentrations is especially important in the "long life" products since they might remain in cooling systems indefinitely.

Installing Corvair Manifolds

Exhaust manifolds on all 1961 Corvair Turbo-Air engines provide an increase in interference fit between the exhaust port sleeve gaskets and the manifold.

To assure full seating of the exhaust manifold on the sleeve gaskets, thereby insuring against exhaust gas leakage, the factory recommends that the following revised procedure be used for manifold installation.

1. Position the exhaust manifold on the sleeve gaskets, tap manifold lightly to insure alignment with the gaskets; then firmly seat manifold using a soft metal or plastic hammer.
2. Install manifold clamps and french locks. Torque attaching nuts to 23-27 ft.lbs., then bend tab on french locks.

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SNAPO AUTOMATIC DELUXE RIVET GUN
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• Pocket Size • All-Steel Construction

For "blind"—and for many non-blind applications—here is the answer to low-cost, quick assembly. "SNAPO Automatic Deluxe" is jam-proof because of automatic ejection of the mandrel nail after the unique rivet is set. Eliminates many welding jobs, replaces sheet metal screws, bolts and nuts, gets into confined areas. Rivets absolutely will not vibrate loose, heads countersunk for easy finishing. *Write today!*

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We invite you to compare, and you'll agree that this is the most durable, highest quality, easiest-to-use "Blind" rivet gun made. Save time and money on fastening, repair jobs.

RICHLINE CO., INC. 1531 E. Franklin Ave. Minneapolis 4, Minn.

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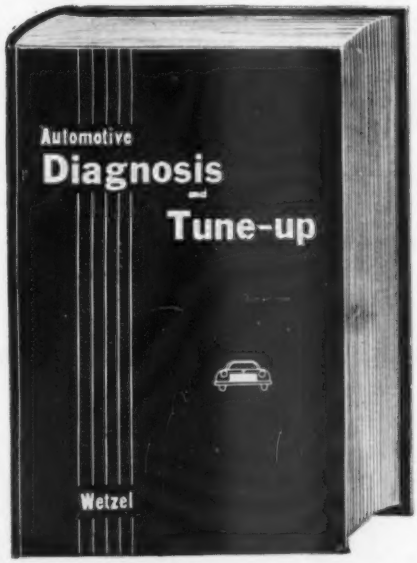
THE MASTERFUL SECOND EDITION OF THIS POPULAR BOOK WILL BE TRULY HELPFUL

The new chapters on The Automotive Oscilloscope and Tune-Up Procedure alone are worth the price of the book! It is a "Gold Mine" of information.

MAKE THIS HELPFUL INVESTMENT TODAY!



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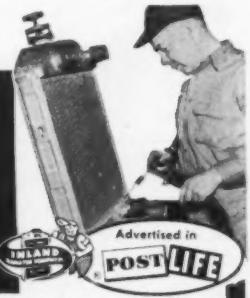

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"Our INLAND Radiator Department brings us an average of $300 A WEEK! (Over $15,000 a year!) Wish we'd installed it years ago!"— Douthit-Carroll-San Chez Company, Memphis, Tenn.

$8,000 to $15,000 A YEAR ADDITIONAL VOLUME IS COMMON! "$400 in my first 10 days!" (Over $12,000 a year!) — Bonifield Brothers, Metropolis, Ill. "Almost $900 in 30 days!" — M. J. Wilson Auto Company, Shelbyville, Ill.

RADIATOR SERVICING BRINGS MORE PROFIT PER SQ. FOOT! 83% of all radiators over a year old are partly plugged. Inland equipment **PROVES** extent of plugging to customer. Inland offers complete package: Equipment, training, "Pays-for-Itself" purchase plan.

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FREE 48-pg. book

INLAND MFG. CO., Dept. AD-4, 1108 Jackson St., Omaha 2, Nebr.
Please send new free book, "Blueprint for Profits."

FIRM _____ (PLEASE PRINT)
ADDRESS _____
CITY _____ ZONE ____ STATE _____
BY _____ TITLE _____
If dealer, make of car sold _____
Are you now operating a radiator shop ☐ Yes ☐ No

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CLASSIFIED RATES—50c per word for each insertion. Minimum 20 words. Display ads $30.00 per column inch. Position wanted ads 25c per word. Box number ads $2.00 additional. Payment in advance for all ads. Closing date 10 days in advance of publication date.

Send all orders to: Classified Advertising Manager,
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Classified Rate: 50c a Word; Minimum Charge $10.00

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900 South Wabash Ave., Chicago 5, Illinois _____ 19____

Please insert the following _____ word Classified advertisements in the_____

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☐ **Check here** if you want your advertisement to run "T. F." (till forbid). This saves you the bother of ordering your advertisement for each issue and insures your not missing an issue. An invoice will be sent in advance for subsequent insertions as all classified advertising is payable strictly in advance. You can then remit for the next issue; make any changes in copy or cancel your advertisement.

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FIRM NAME_____

STREET ADDRESS_____

CITY, ZONE & STATE_____

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Advertisers using an abbreviated firm name or post office box address, must furnish a complete firm name street address and the name of owner, president or general manager, for our office records.

Write or Paste Your Best Pulling Advertisement Here

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20—$10.00
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25—$12.50	26—$13.00	27—$13.50	28—$14.00
29—$14.50	30—$15.00	31—$15.50	32—$16.00
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37—$18.50	38—$19.00	39—$19.50	40—$20.00
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45—$22.50	46—$23.00	47—$23.50	48—$24.00

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ITALIAN MANUFACTURERS diesel injector elements for G.M. Caterpillar, International, American Bosch, CAV, pumps. Seeks Agents U.S., Canada, "DISITAL", Via Lessona 13, Torino, Italy.

AUTOMOTIVE BODY TOOLS

NEW AND RESHARPENED Auto Body Files. File resharpening, quick service, quality workmanship, competitive prices. A. O. Barnes Company, Anderson, Indiana.

BUSINESS OPPORTUNITIES

SEMI-RETIRE IN HEALTHFUL, smog-free Morongo Valley, Calif. Furnished home, garage, and equipment. Write Box 287, Morongo Valley, Calif. for details.

DEALER SERVICE

AUTO GLASS replacement techniques. Professional installations explained. Monthly features save time and money. Auto Glass Journal, 505 Marlboro, Wood-Ridge, New Jersey.

EDUCATION AND INSTRUCTION

STORAGE BATTERIES—New 120 Page Manual gives full instructions. New and Rebuilt. Free Details. P.O. Box 341, New Castle, Pa.

EQUIPMENT

VAN NORMAN Crankshaft Grinder Model III for large shafts. Also Landis Crankshaft Grinder 18 inches by 64 inches between centers, both in excellent condition, bargain. Adams, 1128 Iris Street, San Luis Obispo, Calif.

LEMPCO 545 Automatic Head Surfacer, also VAN NORMAN 562, both excellent. TOBIN ARP Bearing Resizer, VAN NORMAN Piston Grinder, Metco Metal Spray Gun complete. Adams, 1128 Iris Street, San Luis Obispo, Calif.

NEW PRESSURE WASHERS for sale. Manufacturer's List $495.00. Save $100.00. $395.00. For demonstration with no obligation, Phone HO 9-5840 or Post Card to R. A. Nott, 18-701 Ott Ave., Glen Ellyn, Ill.

GOVERNMENT SURPLUS

GOVERNMENT SURPLUS—How and where to buy in your area. Send $1.00, Surplus Information, Department AS, Headquarters Building, Washington 6, D.C.

INVENTIONS WANTED

INVENTIONS Wanted for immediate promotion! Patented; unpatented. Outright Cash or Royalties. Free Protection Form; write Casco, Mills Building, Washington 6, D.C.

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AD BOOK MATCHES
Sell Full or Part Time.

Cash daily commissions bring you tops in steady earnings: Premium Plan for you, customers, lands big orders. Show Glamour Girls, Sensational Tenorama, Hillbillies, Big Holiday Line now ready. All wanted sizes.

FREE Master Outfit tells you where to go, who to see, what to say, for quick sales. Fast Action if you give age, experience.

SUPERIOR MATCH
Dept. BA 1260, 7530 S. Greenwood, Chicago 19

Advertisers' index

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AC Spark Plug Division .....7, 8, 9, 26, 27 & 49
Acme Quality Paints, Inc..... *
Allen Electric & Equipment Co..... *
Allied Automotive Parts Co..... *
Alma Manufacturing Co..... *
Apache Motor Steam Cleaner Co....44
Auto-Test, Inc..... *

Baldwin Mfg. Co., J. A..... *
Barrett Equipment Co.....63
Bean Division, John..... *
Bear Manufacturing Co.....31
Bettcher Manufacturing Corp..... *
Better Parts Specialties..... *
Bishman Manufacturing Co..... *
Bosch Corporation, Robert..... *
Branick Manufacturing Co.....51
Breeze Corporations, Inc..... *
Briggs Shock Absorber Co., The.....42
Buske Manufacturing Co., E. R. 62

Cedar Rapids Engineering Co..... *
Chevrolet Motor Division....20 and 21
Chicago Rawhide Mfg. Co..... *

Delco-Remy Division.....34 and 35
Detroit-Leland Hotel.....77
DeVilbiss Company, The..... *
Ditzler Color Division.....19

Edgewater Automotive Div..36, 70 & 77
Eis Automotive Corp..... *
Electronics, Inc.....44

F. & B. Manufacturing Co..... *
Felt Products Mfg. Co.....Cover 4

Golden Glide Shock Absorber Co., The.....45
Graham Research, Inc..... *
Grant & Grant..... *
Gray Company, Inc., The.....67
Graymills Corporation.....69
Gunk Laboratories, Inc..... *

Hanson Co., Harvey E..... *
Hastings Manufacturing Co..... *
Hellwig Products Co., Inc..... *
Houser Engineering & Mfg. Co., Inc..61
Hygrade Products Division.....25

Ingersoll-Rand Company..... *
Inland Manufacturing Co.....79

K-D Manufacturing Co.....47
Ken Tool Manufacturing Co..... *
King Electric Equipment Co..... *

Lee Company, K. O.....78
Legvold Enterprises, Inc..... *
Lucas Electrical Services, Inc..... *

Malsbary Manufacturing Co.....73
Master Technical Press.....79
McQuay-Norris Mfg. Co.....12 and 37
Milesmaster, Inc.....68
Milwaukee Electric Tool Co..... *
Minnesota Mining & Mfg. Co..... *
MoPar Parts & Accessories Division Chrysler Motors Corp.....11
Muskegon Piston Ring Co..... 4
Mustang Engines..... *

National Market Reports, Inc.76 and 81

Otto-Items, Inc..... *

Perfect Circle Corp.....Cover 2
Permatex Company, Inc..... 1
Practical Manufacturing Co..... *
Precision Automotive Components Co. *

Radiator Specialty Co..... *
Rajah Company..... *
Ramsey Corporation.....Cover 3
Richline Company, Inc.....79
Rinck-McIlwaine, Inc.....51
Rochester Products Division..... *

Schofield Manufacturing Co..... *
Schrader's Son, A..... *
Schwartz Manufacturing Co.....71
Sealed Power Corporation.....33
Shurhit Products Co.....72
Simpson Electric Co..... *
Snap-on Tools Corp.....53
Storm-Vulcan, Inc..... *
Standard Motor Products, Inc.....25
Stant Manufacturing Co., Inc..... *
Sturtevant Company, P. A.....59
Sun Electric Corp..... *
Sunnen Products Co..... *

Timken Roller Bearing Co., The.... *
Trippe Manufacturing Co..... *

U-Joint Tool Company.....57
U.S. Chemical & Plastics, Inc..... *
United Motors Service Division.....55

Victor Manufacturing & Gasket Co..39
Vulcan Manufacturing Co..... *

Wagner Electric Corp.....2 and 3
Wall Colmonoy Corp.....78
Winona Tool Mfg. Co.....57

Firms represented in this issue are indicated by page number. Advertisers in previous issues are indicated by the asterisk.

Calendar of Automotive Events

1961

May 14-17—Automotive Engine Rebuilders Assn., 39th Annual Convention, Hotel Fontainebleau, Miami Beach, Fla.

June 28-July 1—IGO National Convention, Lowry Hotel, St. Paul, Minn.

July 31-Aug. 2—National Auto Accessories & Parts Exhibit, Las Vegas, Nev.

Oct. 29-Nov. 1—National Lubricating Grease Institute, 29th Annual Meeting, Rice Hotel, Houston, Texas.

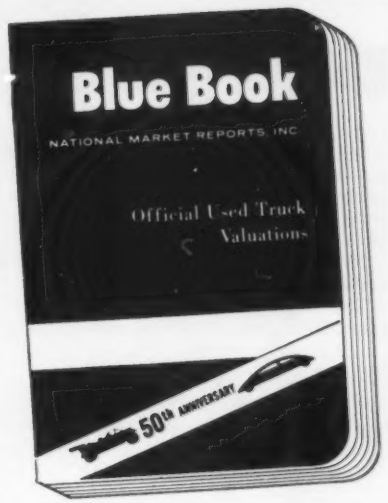
Nov. 8-10—Automotive Parts Rebuilders Assn. Convention & Trade Show, Hotel Biltmore, Los Angeles, Calif.

1962

Feb. 28-March 3—International Automotive Service Industries Show, Navy Pier, Chicago, Ill.

Here is valuable information on every type of truck manufactured

for FINANCING
TRADE-IN
RETAIL PRICES
INSURANCE
TAXES



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Address .....

City ..... *Zone* .... *State* .....

HE WHO LAUGHS, COME WHAT MAY,

WILL LIVE TO LAUGH ANOTHER DAY

Short circuit smiles

A man in the crowded bus was surprised when the attractive young lady across the aisle smiled at him. And he was astounded when, in a pleasant but loud voice, she queried, "Aren't you the father of two of my children?"

"Why, well—that is, I don't know," he sputtered.

"I'm sure you are," she insisted, "I teach fifth grade at the Lincoln School."

★ ★ ★

Wife to husband at party: "Melvin, don't you take another drink. Your face is already getting blurred."

★ ★ ★

Sales Manager: "Do you know how many really great people there are in this country?"

Salesman: "I don't know, but I do know that there is one less than you think."

★ ★ ★

Boss: "You shouldn't fib. Do you know what we do around here to office boys who fib?"

Office Boy: "Yes, sir. When they're old enough you send them out as salesmen."

"I figure I get about 8 miles per boy!"

The self-important oilman dispatched his partner to buy some oil property. "You can go as high as $10 million," he said. "But don't come back without that property."

Later that week the partner reported back. "I got it for $8 million," he said, "but now we're in trouble."

"Impossible! If you got the property, why are we in trouble?"

"Well," answered the partner, "They want $500 down."

★ ★ ★

The photographer was posing the businessman and his college-age son. "Now you sit in this chair," he directed the father, "and you, son, stand next to him with your hand on his shoulder."

"Wouldn't it look more natural," interrupted the father, "if he could put his hand in my pocket?"

★ ★ ★

Mr. Jones believed he was entitled to one night out alone each week. So every Tuesday night he went out. One Tuesday he went out and did not return for seven years. When he did come back his wife was so happy to see him that she phoned all her friends.

"What are you doing?" Mr. Jones shouted.

"I'm arranging a welcome home party for you tonight."

"What!" protested the husband. "It's Tuesday—my night out."

★ ★ ★

A visiting specialist was taken to the cubicle of a mental case who thought he was a king.

"I know I am a king," the man explained, "Satan told me so."

At which a furious voice sounded from the next cubicle: "I told you nothing of the kind."

A man in England decided to visit a married couple he hadn't seen for some time. The wife opened the door.

"Hello, Maggie, nice to see you," he said. "How's Jim?"

"Jim?" she repeated. "Didn't you know? 'E's dead. Went down to the garden to pull a cabbage for dinner and as he bent down he fell dead right there on the spot."

"How terrible!" exclaimed the visitor. "What on earth did you do?"

"Well, what COULD we do? We had to open a tin of peas!"

★ ★ ★

He could not have been over four, the little boy who stood in front of the lost and found desk during the Christmas rush. There were traces of hastily wiped tears on his chubby face, as he inquired, "Has any mother been turned in yet this morning?"

★ ★ ★

Leaving the plush Stork Club one night, a miserly gentleman stalked right past the doorman without tipping him. Nevertheless, the doorman helped the man into the car with a flourish and said pleasantly, "In case you happen to lose your wallet on the way home, sir, just remember that you didn't pull it out here."

★ ★ ★

Doctor: "I don't like the looks of your husband."

Woman: "Neither do I, doctor, but he's very good with the children."

★ ★ ★

A venerable French painter sat in a roadside cafe in Montparnasse stolidly munching bag after bag of potato chips. His luncheon companion watched disapprovingly and finally, consumed with curiosity, asked "Why do you eat so many potato chips?"

The old man carefully shook out the crumbs, folded the cellophane bags in which the potato chips had come, placed them in his pocket and said, "I do it for my cats. They just love to play with cellophane."

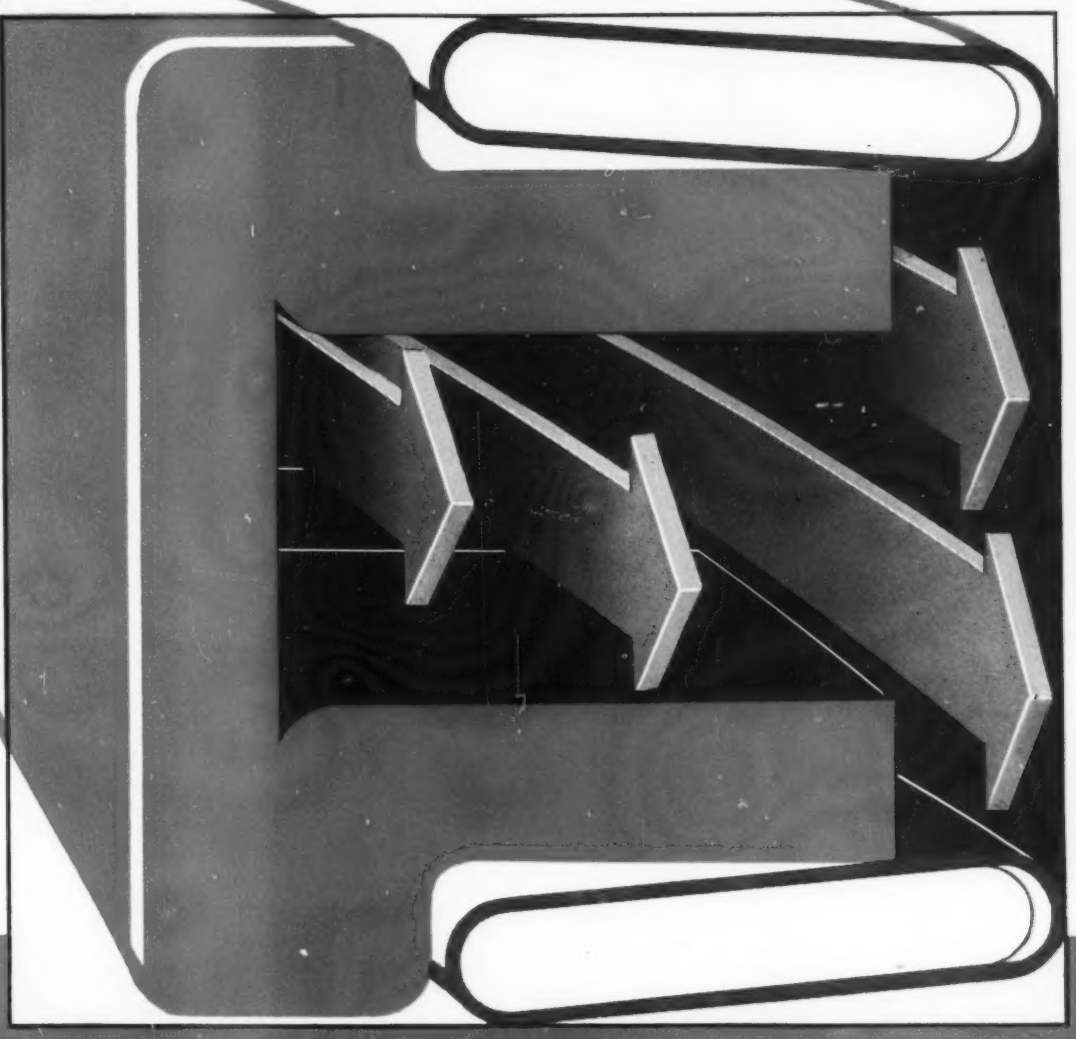
★ ★ ★

Life is an everlasting struggle to keep money coming in and teeth and hair from coming out!

"It's an invention of mine to discourage jay walkers."

RAMCO C-9 BACKBONE

gives you much more flushing space to stop oil clogging



You can easily see: there is much more oil flushing space in the C-9 oil ring than average modern oil rings.

This makes sure oil circulates freely, won't clog or cook in drainage vents. C-9's vents aren't even near the cylinder heat, either—they are 40% farther away, where it's cool.

The backbone makes this difference. Next time you install a C-9 oil ring, study it; feel it. Note the extra big flushing chamber. And when it's installed, note the effectiveness. It works.

the backbone *makes the* difference

Good oil flushing action is only one of many differences the Ramco backbone brings you. They are all described in our folder: "BACKBONE FACTS." See your Ramco Jobber or write for your free copy: RAMSEY CORPORATION, ST. LOUIS 8, MISSOURI, a subsidiary of Thompson Ramo Wooldridge Inc.

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a new
rubber valve
cover gasket
achievement

new FEL-CoPRENE

GUARANTEED
to reduce
installation time
to fit better—to seal better
to out-last and out-perform
any conventional
type gasket!

The secret of the extra resilient, longer lasting performance of new FEL-CoPRENE is the exclusive rubber formula developed by FEL-PRO in conjunction with leading car factories. This special composition rubber maintains its shape and sealing ability at higher pressures and temperatures better than conventional types. Its extra resiliency compensates for expansion—gives better conformability for all surfaces. New FEL-CoPRENE saves on installation time, too. It goes on faster because it fits right every time. FEL-CoPRENE is only available for a limited number of models right now, but you'll be able to get FEL-CoPRENE for most popular late models in the near future. Ask your FEL-PRO Jobber for the facts or write for samples and literature to: Felt Products Mfg. Co., Skokie, Ill. Since 1918.

FEL-PRO gaskets

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with your profit
uppermost in mind!

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